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Medicolegal column

RECENT INDIAN COURT JUDGEMENT ON MEDICAL NEGLIGENCE

CASE SUMMARY

On perusal of pleadings of the complaint, admittedly the left eye cataract operation was performed by OP on 30.09.2008. Thereafter, for about 9 months till June 2009, the patient was under follow up of OP doctor for minor ailments like redness and pain in the eye. The complainant suspected some wrong operation was performed by OP, therefore on 13.07.2009 he approached Sadguru Sewa Sangh Trust, but did not get relief. Therefore, he got checked his operated eye from famous eye specialist Dr Mangtoo Ram and thereafter visited IGIMS at Patna on 28.08.2009. It was diagnosed as left eye vitreous haemorrhage/infective pathology with vitreo-retinal detachment. Thus, it is clear that the complainant came to know the retinal detachment almost one year after the cataract operation. **In NCDRC's view, such retinal detachment or any infective pathology was not due to any negligence during operation which was performed one year back.** [Para 8]

COURT JUDGEMENT

Ref: *Amrendra Kumar Singh vs. Dr Deepak Kumar (Eye Specialist)*, R.P. No.1030 of 2017, (Against the Order dated 03/03/2017 in Appeal No. 155/2013 of the State Commission Bihar), Date of Judgment: 12.03.2020. NCDRC. Access from: URL:http://cms.nic.in/ncdrcusersWeb_GetJudgement.do?method=GetJudgement&caseidin=0%2F0%2FRP%2F1030%2F2017&dtofhearing=2020-03-12

NCDRC observed that commonly and it is more often the presumption of the patient that after any medical or surgical treatment he should get cured completely. However, the result of treatment and prognosis of the disease depends upon several factors in vivo and vitro. Catena of judgments has defined the elements of medical negligence. It should be the bone-in mind that **'no cure is not always negligence'**. In the instant case, NCDRC noted the doctor OP is qualified, performed cataract surgery as per the standard procedure. Proper antibiotic, eye drops advised post-operatively and kept follow up of the patient. The patient developed symptoms of RD/VH after about one year. [Para 11]

Based on the foregoing discussion and in the obtaining facts, NCDRC concluded that it is not feasible to attribute negligence/deficiency on the respondent doctor. It is difficult to conclusively establish medical negligence/deficiency in service on the respondent doctor. [Para 12]

EXPERTCOMMENTS : A doctor who is competent, qualified and followed standard protocol and procedure, even if the patient is not cured completely cannot be held medical negligent /deficiency in service by consumer court as in the above case.

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EDITORIAL

Research in medical sciences: scenario in Assam

Patowary AJ*

Medical Council of India has fixed the minimum eligibility criteria for faculties in medical colleges serving in various posts.

After the notification, it became mandatory for all the faculties to publish their research papers in the journals indexed in the specified indexing agencies and it is not possible to go to a higher posts or promotions if a faculty is not having the requisite number of research publication in his or her credit.

So it has become a necessity for the faculties to publish their research articles in the journals indexed with the specified indexing agencies prescribed by the MCI and the result of such mandatory publication are

- Quality of the publication is going down
- Rise of predatory journals
- Salami publications
- Stealing of authorship
- Ghost authors and many more.

In this regard one has to understand that, if any research article is not based on proper scientific research maintaining all the protocols for that particular research or is based on some fake reproduced data, it will not only cheat the readers of that particular article but also will have much more negative effects as the data may be incorporated in some systemic review or meta-analysis which will give a totally wrong findings based on those data. Also think of the impact if it is related to some drug trial or therapy, it which will have a far reaching consequences.

So, it is always expected that all faculties to maintain at least the minimum standard for their research publications and to choose the journals maintaining the minimum standard for the publications.

However, under the compulsion of publication it is observed that there is a rise of unethical practice in the research publications. At the same time some of the journals are taking advantage of the situation and making money out of this issue.

If we see the global scenario, there has been rise in research activities all around the globe, but of late, China has come out to be the front runner amongst all the new researchers.

India was at par in terms of research publications till last few years but China has passed India now. There is a rise in Chinese publication rates of late with a number of Universities emerging amongst the top universities of the world and the main reason for such growth is the building of infrastructure, training of manpower to use those infrastructure as well as providing the proper facilities and fund for the research works.

However, in India, we are trying to get more and more research activities with construction of the infrastructure for the same in last few years, but not getting the required results.

Particularly in the field of medical science, there is always lack of infrastructure for proper research which is not adequate for the researchers to achieve the goal. Many a time if there is some good infrastructure in some places, proper man power is not available to utilise the same. This is because of the lack of proper initiative from the Government to place the right person in the right place. In a Government system, there is always nepotism, slow progress of work and lack of proper planning, which hinders the progress of research activities.

Another important aspect for creating a proper environment for research is discussions amongst the faculties with their counterparts which enhances the dissemination of knowledge and also encourage the researchers to get in to some research activities. This can be achieved by attending various conferences, symposiums, seminars, etc., which is also lacking in many faculties.

If we take the example of Assam, which is having now seven medical colleges, with around 1500 faculties in them, the number of research publications from these medical colleges having high impact factor are only few. Now what may be the cause behind such apathetic condition. Is it

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because of lack of initiative from the faculty concern or some other cause?

Now let us analyse the scenario in the medical colleges in the state of Assam-

To enter in to a medical colleges in Assam, one must have a postgraduate qualification and he or she will be promoted to the next level, i.e., as Assistant Professor if there is any vacant post available in the medical colleges as there is no time bound promotion system in Assam.

After serving as Assistant Professor for four years and with two publications in an indexed journal as prescribed by the MCI, he or she may be promoted to the Associate professor and similarly after three years as Associate Professor and with two more research publications, with one international publication, he or she will become Professor in a medical college in Assam, provided there is a vacant post available.

So, it is not certain that one will be able to get his or her promotion in time, in spite of fulfilling the prescribed criteria, resulting in stagnation and demoralisation of the faculties who are deprived.

Moreover, there is no point system out of the publications based on the impact factor or so, which resulted in demoralisation of the actual researchers who have done it spending money and time in the research and published the same in high impact journals.

Another important hindrance in the field of research is the absence of transparency in the transfer of the faculties as there is no clear cut guidelines for transferring a faculty from one college to other in Assam. It is done as per the whim of the Government or to be precise the bureaucrats or the minister concerned. Many of the faculties who can maintain a good relation with those at secretariat are seen passing their time in the same colleges year after year and some have to roam around from one college to other as they are not able or did not bother to please those mentioned. So, if a faculty is engaged in some research projects, he or she may have to leave it in the middle of the project. He or she cannot even plan for a project which he or she can finish during their tenure in that particular period, as there is no such roster for transfer of faculties and it is one of the major hurdle in the field of research in the medical colleges in Assam.

Any research will perish if not published in a good journal or presented in a good conference. But there is no or very little support from the Government for attending conferences. Many a time it is seen that, the faculties had to ask for casual leave or earned leave for attending the conferences as there is no provision for any kind of special leave for

the same, not to speak of the financial support for attending the conferences. In this regard, the AIIMS or similar central government institutions have very clear cut guidelines including on duty leave for attending conferences up to 42 days. T.A., D.A., hotel accommodation and registration fee for minimum two national conferences per year and one international conference in two year in lower level faculties and up to four national and one international conferences per year for the level of a professor is provided. The Government of Assam can adopt such a principle which will be beneficial for the faculty development.

Many of the faculties are not aware of the funding agencies to manage the fund for their research, so they cannot go for any extramural grant to meet up the fund for their research activities. The faculties who manage some research grants from some funding agencies also many a time face problem due to frequent transfer as Assam is not having a fair transfer policy for transferring a medical faculty from one institution to other as mentioned above.

There is also a lack of awareness amongst the faculties regarding the funding agencies and many of the research projects are rejected at the very initial stage by the funding agencies as the proposals are not prepared in proper format or are not that attractive to attract the grants. So, there needs to be a proper awareness drive for getting the research grants and it is good to see that of late, there has been massive effort in this field, the IJHRMLP being the front runner along with the Srimanta Sankaradeva University of Health Sciences, Assam.

Of late, there has been little improvement in the field of research due to setting up of the Central research labs in some of the medical colleges, but only few are being utilised to its optimum, may be due to lack of initiative from the administration as well as the concerned faculties.

So, we can hope that there will be increase in good research and publications in the medical field and more particularly from Assam with proper initiative and facilities from the Government side as well as motivation from the faculties towards research.

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ORIGINAL RESEARCH PAPER

Congenital uterine anomalies in women with recurrent spontaneous abortion: a case control study

Dutta Malamoni¹, Mahanta Putul², Das Gokul³, Mahanta Jagadish⁴

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ABSTRACT

Introduction: Recent study reveals that the anatomical abnormalities of uterus cause recurrent spontaneous abortion (RSA). It also causes miscarriage by interruption of the endometrial vasculature resulting in abnormal and inadequate placentation. **Objective:** Aimed to find out the association of congenital uterine anomalies /Mullerian Duct Anomalies (MDA) with recurrent spontaneous abortion. **Materials and methods:** A total of 150 human participants (female) with history of 2 or more episodes of recurrent spontaneous abortion were included in this study. A routine investigation such as HSG and USG was done to detect congenital uterine anomalies. MRI was done in those cases with suspicious USG or HSG findings for confirmation. Similarly 150 numbers of fertile females without any history of abortion were also investigated to detect any congenital uterine anomalies. **Results:** Out of 150 cases 11 cases reported to have congenital uterine anomalies. Also, among 150 females without RSA (Control group), only 3 reported congenital uterine anomalies. Chi-square test was carried out for independence of attributes. **Conclusion:** Patients with congenital uterine anomalies were commonly found to be associated with recurrent spontaneous abortion (RSA). Therefore women with recurrent spontaneous abortion should be investigated by imaging techniques to rule out congenital uterine anomalies.

Keywords: Miscarriage; mullerian duct anomalies; imaging techniques.

INTRODUCTION

Congenital uterine anomalies have been implicated as a cause of adverse pregnancy outcome.^{1,2} The reported

prevalence of congenital uterine anomalies in women with recurrent spontaneous abortion varies between 6-38%.³⁻⁵

The female reproductive tract develops from a pair of mullerian ducts that form the fallopian tubes, uterus, cervix and the upper two third of the vagina. Any disruption of mullerian duct development during embryogenesis can result in a broad and complete spectrum of congenital abnormalities termed mullerian duct anomalies (MDA).

Normal development of the mullerian ducts depends on the completion of three phases, i.e., organogenesis, fusion and septal resorption. Failure of formation of mullerian duct results in uterine agenesis, hypoplasia or an unicornuate uterus. When the two mullerian ducts fail to fuse, the resultant anomalies are either a bicornuate uterus or uterus didelphys. Failure of septal resorption results in a septate or arcuate uterus.⁶

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The uterine septum is the congenital uterine anomaly most closely linked to recurrent miscarriages, with as much as a 76% risk of spontaneous pregnancy loss among the affected women.⁷ Other mullerian anomalies including unicornuate, didelphic and bicornuate uteri have been associated with lesser risk of recurrent miscarriages.^{2,7}

Classification of MDAs: Proper classification of MDAs is important owing to the fact that associated risks of adverse pregnancy outcome and management vary among the anomalies. The most widely accepted classification system has been developed by the American Society of Reproductive Medicine (The American Fertility Society Classifications 1998)⁸ as shown in **Table 1**.

Table 1 Classification of mullerian duct anomalies (MDA)⁸

CLASS I	Hypoplasia and Agenesis: a) Vaginal, b) Cervical, c) Fundal, d) Tubal, e) Combined
CLASS II	Unicornuate: a) Communicating, b) Non-communicating, c) No cavity, d) No horn
CLASS III	Didelphys
CLASS IV	Bicornuate: a) Partial and b) Complete
CLASS V	Septate: a) Partial and b) Complete
CLASS VI	Arcuate
CLASS VII	Diethylstilbesterol (DES) drug related

The aim of the present study was to find out whether MDAs have any significant association with Recurrent Spontaneous Abortion (RSA).

MATERIALS AND METHODS

This case control study was conducted during the period from February 2015 to April 2018 at Gauhati Medical College, Guwahati, Assam.

A total of 150 female participants of reproductive age group ranging from 19-44 years with history of two or more episodes of recurrent spontaneous abortion were included as “case” in this study.

Structured questionnaires were used for collection of data. Prior written informed consent was obtained from the participants. Ethical clearance was obtained from the Institutional Ethics Committee.

The participants were subjected to required radiological investigations with due informed consent as part of routine examination procedures while they attended the Out Patient Department (OPD). Routine investigations such as Hysterosalpingography (HSG) and Ultrasonography (USG) were done to detect MDA in these participants with history of RSA. Magnetic Resonance Imaging (MRI) was done in those cases with suspicious USG or HSG findings for confirmation.

150 fertile female participants in the age range of 19 to 44 years without any history of RSA were included in this study as “control”. These individuals came to the Obstetrics

and Gynaecology department for other gynaecological problems. They were subjected to routine USG as advised by the treating Gynaecologist. Prior written informed consent was obtained from these individuals while enrolling them as “control”.

The congenital uterine anomalies or more precisely MDA detected in this study were classified according to classification developed by the American Society of Reproductive Medicine (The American Fertility Society classifications 1998).⁸

The data thus collected were analysed with SPSS software version 20.

RESULTS

In this study, among 150 females with RSA (Case group), 11 reported to have MDAs.

Maximum number of patients (n=4, 36.36% of overall anomalies) had class V anomaly (**Figure 1**) followed by class II anomaly (n=3, 27.27%).

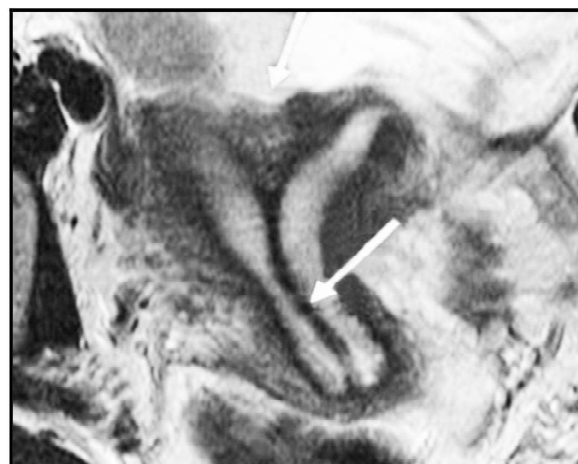


Figure 1 MRI of complete septate uterus

Class VI (**Figure 2**) anomaly was detected in two patients (18.18%). Class III anomaly was observed in one patient (9.09%), while another patient (9.09%) presented with Class IV anomaly. Class I and class VII anomalies were detected in none of the patients (**Table 2**).

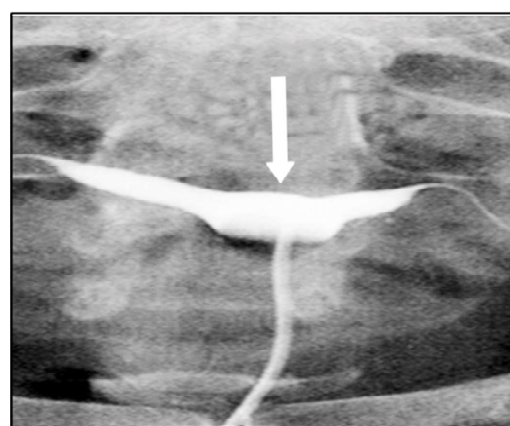


Figure 2 HSG of arcuate uterus

Among 150 females without RSA (control group), MDAs were detected in 3 individuals. Class I, II, III, V and VII anomalies were conspicuously absent among controls. Class IV anomaly (**Figure 3**) was detected in one individual (33.33% of overall anomaly) while in two individuals (66.67% of overall anomaly) Class VI anomaly was detected (**Table 2**).

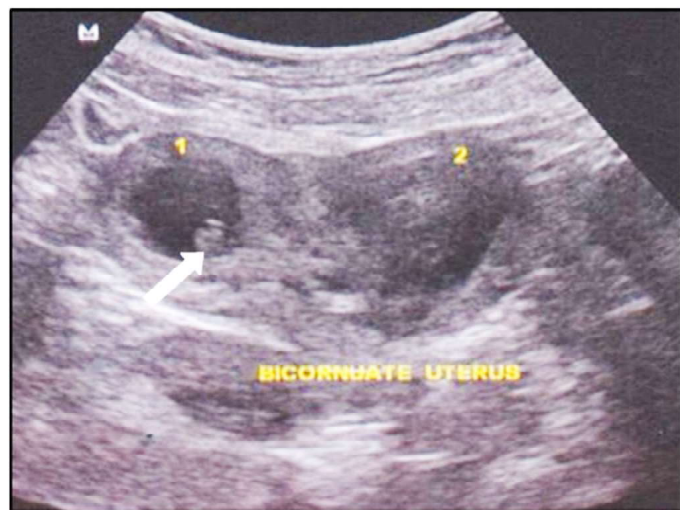


Figure 3 Bicornuate uterus (USG) with viable foetus in right cornue (arrow head)

Table 2 Type of MDAs in Cases and Control group

Classification	Type of Anomaly	No. of Anomalies	
		Case	Control
CLASS I	Agenesis/Hypoplasia	-	-
CLASS II	Unicornuate	3	-
CLASS III	Didelphus	1	-
CLASS IV	Bicornuate	1	1
CLASS V	Septate	4	-
CLASS VI	Arcuate	2	2
CLASS VII	Diethylstilbesterol	-	-

To study whether MDAs has any significant association with RSA or not, Chi-square test was carried out.

The SPSS software was used for the calculation, and the output is given in **Table 3**.

Table 3 Chi square test table for independence of patient groups and their anatomical condition

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	4.795 ^a	1	.029		
Continuity Correction ^b	3.671	1	.055		
Likelihood Ratio	5.084	1	.024		
Fisher's Exact Test				.052	.026
Linear-by-Linear					
Association	4.779	1	.029		
N of Valid Cases	300				

- 0 cells (0.0%) have expected count less than 5. The minimum expected count is 7.00.
- Computed only for a 2x2 table

From the above table it was observed that the p-value for Pearson Chi-square test is 0.029 which is less than 0.05 and hence conclusion can be made that there is a significant association of MDAs with RSA.

Odds ratio was calculated and it was found that the odds of MDA are 3.8 times higher among women with RSA compared to women without RSA.

DISCUSSION

In the present study, we have found a significant association of MDA with recurrent spontaneous abortion. The exposure rate for cases were found to be higher than control.

The exact role of congenital uterine anomalies in recurrent miscarriage remains unclear since the prevalence and reproductive outcomes of uterine anomalies in the general population are not known.⁹ A systemic review of past studies concluded that MDAs were present in 4.3% (range: 2.7%-16.7%) of normal fertile women and in 12.6% (range: 1.8%-37.6%) of women with recurrent miscarriages.¹⁰ The wide variability in prevalence is due to the difference in the inclusion criteria and type of diagnostic techniques used for detection of the anomalies.

In the present study only 3 cases of mullerian anomalies were found in the control group, i.e., 2% in comparison to 7.33% of cases. According to Jaslow¹¹ congenital anomalies are found in 8.4%-12.6% women with recurrent miscarriages, which is seven to eight times higher than the general population. So our findings are similar to that of made by the other authors in the past.

The congenital uterine anomalies most commonly associated with recurrent spontaneous abortion include bicornuate, septate and uterus didelphus.⁷ In our study the most common uterine anomaly found in cases was septate uterus with an incidence of 36.36%. According to John et al¹² septate uterus is the major anomaly responsible for recurrent spontaneous abortion. Talaviya and Suvagya¹³ also stated that among the various congenital uterine anomalies, the septate uterus is the most common anomaly associated with recurrent miscarriage.

It is beyond doubt that septate uterus is associated with an increased risk of spontaneous abortion because it interferes with implantation. Though septate uterus remains the most common and anatomically less complex congenital anomaly, it is associated with the poorest reproductive outcome, with miscarriage rates more than 60 percent and fetal survival rate as low as 6 to 28 percent.¹⁴

The second most common anomaly found in our study was unicornuate uterus with an incidence of 27.27%. Ludmir et al¹⁵ reported that there is a high rate of pregnancy loss (80%) in unicornuate uterus. Unicornuate uterus with non-

communicating rudimentary horn is susceptible to many gynaecological and obstetric complications which can occur at any stage of reproductive life.¹⁶ In our study we found a case of unicornuate uterus with non-communicating rudimentary horn.

In present study, we found two cases of arcuate uterus among 150 women with history of recurrent abortion. Similarly two cases of arcuate uterus were also detected in the control group. According to Raga et al² live birth rate (82.7%) of arcuate uterus is higher as compared with other uterine anomalies, eg. bicornuate uterus (62.5%) and septate uterus (62%). Compared with women with a normal uterus, women with an arcuate uterus have a higher proportion of second trimester losses and preterm labour.¹⁷ Priya and Vijayalakshmi¹⁸ reported arcuate uterus to be the most common uterine anomaly in their study in an unselected population.

In our study, didelphys and bicornuate uterine anomalies were detected in women with recurrent miscarriages, both with the incidence of 9.09% among the all abnormalities. The prevalence of bicornuate and uterus didelphys is significantly higher in patients with recurrent miscarriage than in general population.^{19,20}

In our study, in the control group an woman with bicornuate uterus was detected who came out with a successful pregnancy outcome delivering a baby at term. A bicornuate uterus does not always lead to obstetric complications. It may carry a pregnancy to term.²¹

Raga et al² in their study concluded that uterine anomalies are relatively frequent in fertile women and more frequent in infertile patients. They observed that the reproductive performance of the unicornuate and didelphys uteri was poor as compared to the septate and bicornuate uteri. According to them arcuate uterus had no impact on reproduction.

CONCLUSION

MDA are one of the important causes of recurrent pregnancy loss. Most of the anomalies can be diagnosed initially by routine hysterosalpingography and ultrasonography. However advanced imaging techniques such as MRI may be required for a definitive diagnosis. Since women with recurrent miscarriages have a higher prevalence of congenital uterine anomalies, they should be thoroughly investigated with proper imaging techniques for early detection and proper management of such cases.

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(1) The article is original with the author(s) and does not

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- (2) The article has not been published (whole or in part) elsewhere, and is not being considered for publication elsewhere in any form, except as provided herein.
- (3) All author(s) have contributed sufficiently in the article to take public responsibility for it and
- (4) All author(s) have reviewed the final version of the above manuscript and approved it for publication.

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ORIGINAL RESEARCH PAPER

Clinicopathological presentation of treatment naive crescentic v/s non-crescentic lupus nephritis patients

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ABSTRACT

Introduction: Renal biopsies play an important role in the diagnosis, management and prognosis of patients with lupus nephritis (LN). This paucity of knowledge in this particular area prompted us to undertake this retrospective analysis of clinicopathological presentation of biopsy-proven LN.

Materials and methods: Biopsy proven (n=120) treatment naive LN class IV patients from March 2007 to August 2018 were included. Out of these, 85 were class IV non-crescentic and 35 were class IV crescentic lupus nephritis patients. Clinical and histopathological data were studied retrospectively. **Results:** Patients with crescentic LN presented with significantly more severe disease (anemia, renal failure, higher serum creatinine level and hypertension and hematuria) as compared to the non-crescentic group ($p < 0.05$). Mean scores of activity index and chronicity index in crescentic LN patients were significantly higher ($p < 0.001$ and 0.014 respectively), and not crescent but near about all parameters (except glomerular sclerosis, $p = 0.61$ and subendothelial immune deposition, $p = 0.52$) of these scores were significantly higher in the crescentic group. The average intensity of IgG, IgA, IgM, and C3 was lower and average intensity of C1q was higher in the crescentic group. But only the difference in IgA reached statistical significance.

Conclusion: In our study, crescentic LN patients had lower hemoglobin levels, with more hematuria and hypertensive patients and also had higher Activity Index and Chronicity Index compared to non-crescentic LN. Not only crescent but, near about all parameters of these scores were significantly higher in crescentic group. The average intensity of IgA was significantly higher in non-crescentic group in IF study.

Keywords: Activity index; histopathology; chronicity index; glomerulonephritis.

INTRODUCTION

Crescentic Glomerulonephritis (GN) is a light microscopic feature of severe injury of glomeruli, that can be caused by many different etiologies, and is not a disease per se. However, different crescentic glomerular diseases have different clinical presentation and outcome. Crescentic Post-streptococcal Glomerulonephritis (PSGN) has a relatively better prognosis than Lupus Nephritis (LN).

Initially, the term 'Lupus' was first used by the Romans for ulcerative lesions of skin in patients of Systemic lupus erythematosus (SLE), with a resemblance to wolf bite.

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(Lupus, a Latin term, means wolf). William Osler has first mentioned nephritis as a part of SLE disease activity.¹ SLE is an autoimmune disease.² In the SLE population, 40 to 70% of the patients develop LN in their clinical course.³

Notwithstanding the advancement in therapy for lupus, conversion rate to end stage renal disease has remained 10% in 5 to 10 years, that has unfortunately remained unchanged over the last 3 decades.^{4,5}

The prevalence rate of lupus nephritis in SLE patients was 5 to 10 times higher in Indo-Asians (Asians of Indian subcontinent) in comparison with the rate in the white population,⁶ although long standing prognosis are similar in both the population.⁷ So, race is also an important factor to predict severity and outcome in LN.

Presently, only few studies are available which throw light on the exact effect of presence of crescents on clinicopathological spectrum in lupus nephritis patients in Indian population.

This is a retrospective observational study done with aims to understand the nature and behavior of this non-conquered disease from Roman era, in Indian population, in terms of presence versus absence of crescents.

The study aims to determine the relative clinicopathological spectrum of crescentic v/s non-crescentic treatment naïve Lupus Nephritis patient.

Materials and Methods

Inclusion Criteria: 1. Informed consent 2. ≥ 18 years of age. 3. Not taken any conventional disease (SLE/LN) specific immunosuppressive therapy in past. 4. Diagnosis of ISN/RPS Class IV LN. 5. >10 glomeruli in renal biopsy and biopsy was done within 1st week of admission

Exclusion Criteria: 1. Significant or uncontrolled medical disease in any organ system not related to SLE or LN. 2. Concomitant chronic conditions, excluding SLE (eg, Asthma, Crohn's disease) that require immunosuppressives 3. History of renal transplant. 4. Known HIV, Hep B or C infection.

The clinico-pathological archives of 120 adult patients with renal biopsy-proven International Society of Nephrology (ISN/RPS) class IV-G, treatment naïve LN, diagnosed between March 2007 to August 2018 in department of Nephrology, Gauhati Medical College, Assam were reviewed.

Clinical and histopathological data at the time of presentation were studied retrospectively and divided into two groups: Group a - Crescentic lupus nephritis group, $n=35$ ($\geq 50\%$ crescents) and Group b - Non crescentic lupus nephritis group, $n=85$ ($<50\%$ crescents).

Pathologist, with knowledge of patient's clinical course, reported the pathological features. A crescent is defined as

either proliferating extracapillary lesions occupying $>25\%$ of the Bowman's capsular circumference.⁸ Diffuse global lupus nephritis (class IV-G) was defined as more than 50% of glomeruli display endocapillary or extracapillary glomerulonephritis. In this class, patients with crescentic glomerulonephritis, defined as more than 50% of glomeruli, had crescent formation on light microscopy, and always presented with rapidly progressive glomerulonephritis clinically. Crescents should be composed of more than 2 cell layers in order to distinguish them from apposition of the single layers of hypertrophied visceral and parietal cells.⁹

The renal biopsy specimens were examined under light microscopy, direct immunofluorescence techniques. Renal biopsy specimens were fixed in 4.5% buffered formaldehyde for light microscopy. Consecutive 3-mm serial sections were used for histological staining. Stains employed included hematoxylin and eosin, silver methenamine, periodic acid-Schiff and Masson's trichrome. Pathological parameters such as activity indexes and CI were approached by renal pathologists using a modification of an earlier reported system involving semi-quantitative scoring of specific biopsy findings.^{8,10}

Direct immunofluorescence examination- The immunofluorescence for deposition of immunoglobulin IgG, IgA, IgM, C3 and C1q, was semi-quantitatively graded from 0 to 4+ according to the intensity of fluorescence. Intensity of staining was scored as negative (0), mild (1+), moderate (2+), strong (3+), or very strong (4+).

The patients fulfilled the American College of Rheumatology revised criteria for SLE, 1997.¹¹ The disease activity was assessed by the SLE Disease Activity Index (SLEDAI).¹²

The detailed clinical data of patients were retrospectively analyzed. Informed consent was obtained for blood sampling and renal biopsy from each patient. Baseline clinical examination included serum anti-dsDNA antibodies, hemoglobin, white blood cell count, red blood cell count, platelet count, serum albumin, serum creatinine (SCr), C3, and C4, urine routine microscopy and 24-h urine protein.

Statistical Analysis

Quantitative data were expressed as mean \pm SD, and median (interquartile range). Differences of numerical data with normal distribution were tested by Student t test. Categorical data were interpreted in the form of constituent ratio and percentage, and compared by chi-square test. Statistical significance was considered as $p < 0.05$.

RESULTS

Among the 340 patients diagnosed with lupus nephritis during March 2007 to August 2018 in Department of Nephrology, GMC, Guwahati, Assam, 120 cases were reclassified as class IV treatment naïve patients. In total, 35 of this 120 patients (29.17%) also fulfilled the diagnosis of

crescentic glomerulonephritis. In patients with crescentic glomerulonephritis, 26 (74.29%) were female and 9 (25.71%) were male with an average age of 22.42 ± 4.3 years at presentation. The mean value of serum creatinine was 3.74 ± 2.68 mg/dl (range 1.7–11.4 mg/dl) on diagnosis. In non-crescentic glomerulonephritis group, 69 (81.18%) were female and 16 (18.82%) were male with an average age of 21.97 ± 4.74 years at presentation, and mean value of serum creatinine was 2.33 ± 0.753 mg/dl on diagnosis (**Table 1**).

Table 1 Comparisons of baseline clinical and laboratory variable

Clinical Parameter	CGN	NCGN	p-value
No. of patients	35	85	
Gender (M/F)	9/26	16/69	
Age (in years, mean \pm SD)	22.42 ± 4.3	21.97 ± 4.74	0.812
Anemia (n, %)	35 (100)	67 (78.82)	0.001
Renal Dysfunction (n, %)	27 (81.1)	41 (48.23)	0.001
Hb (gm%)	8.5 ± 1.287	11.14 ± 1.728	0.002
S.Creatinine (mg/dl)	3.74 ± 0.594	2.33 ± 0.753	0.017
24 Hrs Urine protein (gm/day)	3.0 ± 0.594	2.58 ± 0.822	0.006
Hypertention (n, %)	32 (91)	39 (45.88)	<0.001
SBP (in mm Hg, mean)	163.26 ± 13.565	140.54 ± 16.378	0.003
DBP (in mm Hg, mean)	94.51 ± 7.660	85.34 ± 7.530	<0.001
Microscopic Hematuria (n, %)	26 (74)	48 (56.47)	0.006
Serum albumin (gm/dl)	2.20 ± 0.390	2.29 ± 0.618	0.417
Nephrotic syndrome (n, %)	27 (77.14)	62 (72.9)	0.4
Positive ANA	35 (100)	82 (97)	0.35
Positive anti ds DNA	34 (97)	76 (90)	0.16

There was a significantly higher proportion of hypertension ($p = 0.002$) in the crescentic group. The patients with crescentic LN had significantly higher mean systolic and diastolic blood pressure when compared to patients with non-crescentic LN (163 vs 140 mmHg; $p = 0.003$ and 94 vs 85 mmHg; $p = 0.001$ respectively respectively). The proportion of patients showing hypertension (91% vs 45.88%; $p = 0.002$), haematuria ($n = 26$, 74% vs $n = 48$, 56.47%; $p = 0.006$), renal dysfunction (81.1% vs 48.23%; $p = 0.001$), and anemia (100% vs 78.82%; $p = 0.001$) was significantly higher in crescentic LN group than non-crescentic LN group. Significantly decreased mean Hb levels (8.5 ± 1.287 vs 11.14 ± 1.728 g/dL; $p = 0.001$) and significantly increased mean urine protein (3.1 vs 2.57 g/day; $p = 0.006$) and mean serum creatinine (3.74 vs 2.33 mg/dL; $p = 0.003$)

levels were observed in patients with crescentic LN than non-crescentic LN (**Table 1**).

Percentage of nephrotic syndrome (77.14% vs 72.9%; $p=0.4$) were comparable between patients of crescentic LN and non-crescentic LN groups. No significant difference was seen in the mean serum albumin levels between patients of both the groups (2.2 vs 2.29 g/dL; $p = 0.428$) The difference in presence of ANA (100% vs 97%; $p = 0.76$) and Anti dsDNA (97% vs 90%; $p = 0.87$) in serum were not clinically significant (**Table 1**).

In light microscopy study, mean scores of activity index and chronicity index in crescentic LN patients were significantly higher ($p < 0.001$ and 0.014 respectively), and not only crescent but near about all parameters (except glomerular sclerosis, $p = 0.61$ and subendothelial immune deposition, $p = 0.052$) of these scores were significantly higher in crescentic group (**Table 2**).

Table 2 Light microscopy and Immunofluorescence parameters

Light Microscopy	CGN	NCGN	p-value
No. of biopsies	35	85	
No. of glomeruli	19 ± 2.81	18.88 ± 2.826	
% of sub-class A	18	21	
% of sub-class A/C	56	62	
% of sub-class C	26	17	
AI score	12.37 ± 0.94	6.82 ± 1.356	0.001
Cellular crescents	6 ± 0	1.2 ± 0.986	0.001
Karyorrhexis/fibrinoid necrosis	1.54 ± 0.67	1.21 ± 0.411	0.0013
Interstitial inflammation	1.61 ± 0.47	1.39 ± 0.49	0.038
Glomerular leukocyte	1.77 ± 0.426	1.61 ± 0.49	0.04
Endocapillary hypercellularity	1.8 ± 0.40	1.39 ± 0.49	0.01
Subendothelial hyaline deposits	1.64 ± 0.44	1.41 ± 0.495	0.052
CI score	4.4 ± 1.16	3.98 ± 0.899	0.014
Fibrous crescents	2.45 ± 0.64	0.6 ± 0.49	0.001
Tubular atrophy	1.31 ± 0.42	1.1 ± 0.34	0.038
Interstitial fibrosis	1.0 ± 0.68	0.78 ± 0.49	0.041
Glomerular sclerosis	1.31 ± 0.47	1.38 ± 0.85	0.61
Immunofluorescence parameters			
Number of biopsies	35	85	
Ig G	1.26 ± 0.41	1.38 ± 0.41	0.81
Ig M	1.3 ± 0.49	1.43 ± 0.36	0.63
Ig A	1.13 ± 0.63	1.54 ± 0.49	0.013
C1 q	1.17 ± 0.38	1.16 ± 0.43	0.77
C3	1.92 ± 0.79	2.1 ± 0.68	0.36

In light microscopy, the average activity index were 12.37

± 0.94 vs 6.82 ± 1.356 ($p < 0.001$), and average chronicity index was 4.4 ± 1.16 vs 3.98 ± 0.899 ($p < 0.014$). In semi-quantitative scale average cellular crescent score was 6 ± 0 vs 1.2 ± 0.986 ($p < 0.001$); average karyorrhexis/ fibrinoid necrosis score was 1.54 ± 0.67 vs 1.21 ± 0.21 ($p = 0.0013$); average interstitial inflammation score was 1.61 ± 0.47 vs 1.39 ± 0.49 ($p = 0.038$); glomerular leukocytosis score was 1.77 ± 0.426 vs 1.61 ± 0.49 ($p = 0.04$); average endocapillary hypercellularity score was 1.8 ± 0.40 vs 1.39 ± 0.49 ($p = 0.01$) and average subendothelial immune deposition score was 1.64 ± 0.4 vs 1.41 ± 0.495 ($p = 0.052$) (**Table 2**).

In chronicity index: In semi-quantitative scale average fibrous crescent score was 2.45 ± 0.64 vs 0.6 ± 0.49 ($p < 0.001$); and average tubular atrophy score was 1.31 ± 0.42 vs 1.1 ± 0.34 ($p = 0.038$); average interstitial fibrosis score was 1.0 ± 0.68 vs 0.78 ± 0.49 , ($p = 0.04$) and average glomerular sclerosis score was 1.31 ± 0.47 vs 1.38 ± 0.85 ($p = 0.61$) in crescentic versus non-crescentic group respectively (**Table 2**).

On evaluation of immunofluorescence parameters, there was no significant difference in the locations of immunoglobulin deposition between the two groups. However, the average intensity of IgG, IgA, IgM, and C3 and was lower in patients with crescentic glomerulonephritis in immunofluorescence study and average intensity of C1q was higher in crescentic group. The difference in IgA was only reached statistical significance in these finding (**Table 2**).

DISCUSSION

Renal involvement is not very uncommon in SLE and there are a number of different pathological phenotypes of lupus nephritis. Although crescent formation is common in lupus nephritis especially in the background of proliferative glomerular lesions, the ratio of 'true' crescentic glomerulonephritis in lupus nephritis is not clear and the pathogenesis remains inconclusive.

In the literature, Sumethkul V et al. showed that lupus nephritis with crescentic glomerulonephritis accounted for 51.6% of all patients with biopsy-proven various crescentic glomerulonephritis.¹³

Therefore, lupus nephritis with crescentic glomerulonephritis should be paid more attention. In our study, comparison with lupus nephritis class IV-G without crescentic glomerulonephritis, crescentic group had more severe disease with higher creatinine levels and lower hemoglobin levels, with more hematuria and with more hypertensive patients.

In histopathological analysis of our study, crescentic group had higher mean Activity Index and mean Chronicity Index compare to non-crescentic LN. Not only crescent but, near

about all parameters (except glomerular sclerosis and subendothelial immune deposition) of these scores were significantly higher on semi quantitative scale in crescentic group compare to non-crescentic LN. In Zhang W et al¹⁴. study 51.5% patients demonstrating crescents at biopsy, and had more severe baseline status: more proteinuria, more severe microscopic hematuria, lower estimated eGFR, and higher pathological scores for both activity index (AI) and chronicity index (CIn) (all $p < 0.001$, respectively).

It was not surprising that patients with crescentic glomerulonephritis had a significantly higher more severe disease with higher creatinine levels and lower hemoglobin levels, more hematuria and with more hypertensive patients, because of the presence of rapidly progressive glomerulonephritis clinically in our study.

More interestingly, we found that the average intensity of IgG, IgA, IgM, and C3 and was lower in patients with crescentic glomerulonephritis in immunofluorescence study and average intensity of C1q was higher in crescentic group. The difference in IgA only reached statistical significance.

These results suggested that both acute and chronic lesions in renal biopsy were more prominent in patients with crescentic glomerulonephritis.

A study by Fung et al¹⁵. showed significantly increased AI and CI scores in patients of crescentic LN group. Fung et al¹⁵. also reported significantly lower intensity of IgA and higher score for interstitial inflammation, which corroborates with the present study findings. However, the insignificantly lower score of karyorrhexis/fibrinoid necrosis, glomerular leukocyte and endocapillary hypercellularity in crescentic LN patients in their study contradicts with the present study results. They also reported significantly lower average intensity of IgA, IgM and C1 q in patients with crescentic LN.

The main limitations of the present study were retrospective approach and single center study design. The time of presentation to renal biopsy was not considered. Further, effect of treatment and long term follow up was not considered.

CONCLUSION

In North-East Indian population, crescentic LN patients had more severe disease with higher creatinine levels, more nephrotic syndrome and lower hemoglobin levels, with more hematuria and hypertension. In histopathological study this group had higher Activity Index and Chronicity Index compare to non-crescentic LN. Not only crescent but, near about all parameters (except glomerular sclerosis and subendothelial immune deposition) of these scores were significantly higher in crescentic group compare to non-crescentic LN. The average intensity of IgA was significantly

higher in non-crescentic group in IF study.

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ORIGINAL RESEARCH PAPER

Study on in-vitro sensitivity of the bacterial agents responsible for postoperative wound infection

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ABSTRACT

Introduction: The term post operative wound infection, also known by the term surgical site infection (SSI) is as old as the beginning of surgery. The majority of post operative wound infection (SSI) become apparent within 30 days of an operative procedure and most often between 5th and 10th post operative days. Extensive use of different antibiotic to cure the post operative sepsis is disadvantageous because it encourages colonization of the body by the organisms resistant to it while it becomes potential source of infection to other. **Materials and methods:** This was a hospital based observational, descriptive study carried out on 2685 SSI wound samples were included in the present study collected from General Surgery, Orthopedic, Obstetrics and Gynaecology Departments. **Results:** 65.8% of the cultured infected wounds were of monomicrobial etiology. Longer durations of surgery was associated with polymicrobial agents, Klebsiella, E. coli and Pseudomonas. Organisms might be transferred to the wound by prolonged contact with the operating staff and equipment, as airborne spread of the Gram negative organisms is rare. Most of the isolates were resistant to the commonly used antibiotics. **Conclusion:** It has also been suggested that organisms showing multi-resistant character to antibiotics are more virulent than others. Hence rationality in the use of specific antibiotics has become inevitable. Based on the above observations preventive and prophylactic measures a reducing the pre-operative stay to minimum, minimizing the length of operation, treating infection present at other sites on the patient, using a good surgical technique.

Keyword: Surgical site infection (SSI); monomicrobial agents; polymicrobial agents; gram negative; antibiotics.

INTRODUCTION

The term post operative wound infection, also now by the term surgical site infection (SSI)¹ is as old as the beginning of surgery. Studies of many workers show that the incidence is still alarming which frightens both surgeons and patients.^{2,3} The majority of post operative wound infection (SSI) become apparent within 30 days of an operative procedure and most often between 5th and 10th post operative days. However, where a prosthetic implant is used, infection affecting the deeper tissues may occur several month after the operation.^{4,6} Altimeter stated that the principal organisms of SSI were staphylococcus (both coagulase positive and negative) Escherichia coli, proteous, klebsiella, pseudomonas, bacteroides, streptococcus and Clostridium perfringens. Since last 25 year,⁷⁻⁹ the incidence of wound infection due to gram negative organisms is increasing though, staphylococcal infection was more common earlier.¹⁰

Regarding the use of antibiotics, it was become quite apparent that extensive use of different antibiotic to cure the post operative sepsis is disadvantageous because it encourages colonization of the body by the organisms resistant to it

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while it becomes potential source of infection to other. *Staphylococcus aureus* one of the main causative organisms, has developed multi resistant character to antibiotics.¹¹⁻¹³ It has also been suggested that organisms showing multi-resistant character to antibiotics are more virulent than others. Hence rationality in the use of specific antibiotics has become inevitable.^{14,15}

Therefore the author has aimed to study the in-vitro sensitivity of isolated bacterial agent responsible for postoperative wound infection (SSI) to different antibiotics.

MATERIALS AND METHODS

A total of 2685 SSI wound sample were included in the present study. It was carried out in the Department of, Microbiology, Gauhati Medical College and Hospital for a period of one year. The materials were obtained from patients in the General Surgery, Obstetrics & Gynaecology and Orthopaedic Departments of GMCH, who had undergone operations and had developed Signs and Symptoms of post-operative wound infections. Cases of clean and clean contaminated surgeries are included for the study whereas procedures in which healthy skin was not incised, such as opening of an abscess, burn injuries and donor sites of split skin grafts, contaminated and dirty surgeries are excluded from study samples.

Collection and transportation of material

The wounds were examined for suggestive signs/symptoms of infection in the post operative period, during wound dressing or when the dressings were soaked, until the patient was discharged from the hospital and also in the Out-patient department after discharge. All the specimens collected were transported immediately to the laboratory for further processing. The Nutrient broth and Robertson's cooked meat broth (RCMB) were incubated at 37°C.

Methods: The samples collected were processed as follows

- Direct microscopic examination of gram stained smear. The smear was screened for pus cells, the gram reaction, morphology, arrangement and number of types of the organisms were noted.
- Inoculation of the samples onto different culture media for aerobic and anaerobic onto plates of MacConkey agar and 5% Sheep blood agar organisms.
- Preliminary identification.
- Bio-chemical tests.
- Antibiotic sensitivity.

RESULTS

The following results were made from the study.

Figure 1 Incidence of SSI

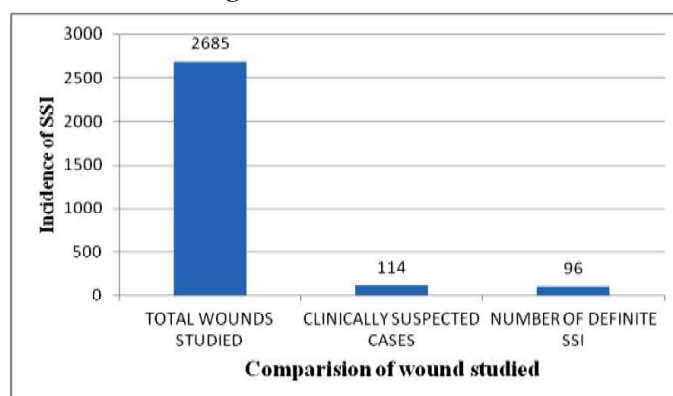


Figure 1 depicts out of the 2685 cases with surgical wounds, 114 cases (4.2%) were suspected to be clinically infected. Amongst 114 (4.2%) infected wounds, 96 (3.6%) were found culture positive and were considered definite cases of surgical site infection.

Table 1 Organisms isolated in 96 SSI

Organism	No.	%
Klebsiella species	35	22.3
Staphylococcus aureus	31	19.4
E.coli	24	15.3
Pseudomonas	20	12.7
Cons	18	11.5
Acinetobacter	07	4.5
Proteus species	07	4.5
Diphtheroids	05	3.4
Citrobacter	03	1.9
Enterococci	02	1.3
S.pyogenes	02	1.3
Candida	03	1.9
Total	157	100

Table 2 Direct microcopy and culture sensitivity

Direct microcopy	Microscopy Positive	Culture Positive
Pus cells + gpc	03	03
Pus cells + gnb	20	20
Pus cells + gpc + gnb	56	56
Few pus cells + no organism	19	06
No pus cells + no organism	16	11

Table 2 shows, on direct microcopy of the gram stained smears of 114 samples, pus cells and organism were seen in 79 samples. In smears from 19 wounds, few pus cells and no organisms were seen but 6 yielded growth on culture. In 16 specimens where no pus cells and no organisms were seen, 11 were culture positive.

Table 3 Pattern of isolates in 96 SSI

Culture Reveal	Name and number of organism									Total
One organism I54.2%)	Kleb. 16	Staph. 11	Cons. 8	E. Coli. 6	Acin. 4	Prot. 3	Pseudo 2	Diphth. 1	Citro. 2	52
Two organisms (45.8%)	Staph. & E.coli 5	Staph & kleb (6) staph(3) & Citro-(1)	Kleb & Pseudo (4) Kleb & prot (1)	Cons & Kleb (2)	Cons& e.coli (2) cons & pseudo (2)	Staph & Strepto (2) Staph & enter (1)	E.coli & kleb (2) citr & prot (1)	Pseud O & Candid a (2)	Acin & Enter (1)	32

The above table (**Table 3**) shows, out of 96 culture positive cases, 52 samples (54.2%) yielded monomicrobial isolates, Klebsiellas species were the predominant organisms isolated in 16 cases (16.70%). The other common monomicrobial isolates were staphylococci aureus in 11 cases (11.4%) and coagulate negative staphylococci in 8 cases (8.3%). 2 organisms were present in 44 cases (45.8%).

Table 4 Organisms isolated in wound types

Organism	Total	Clean		Clean Contaminated	
		No.	%	No.	%
Klebsiella sp.	35	11	31.4	24	68.6
Staph. Aureus	31	19	61.3	12	38.7
E. Col,	24	09	37.5	15	62.5
Pseudomonas	20	11	61.1	07	38.9
Cons	18	10	50	10	50
Acinetobacter	07	03	42.8	04	57.1
Proteus sp.	07	02	28.6	05	71.4
Diphtheroids	05	03	42.8	04	57.8
Citrobacter	03	04	20	04	80
Enterococci	02	02	100	00	00
Strepto.pyogenes	02	02	100	00	00
Candida	03	00	00	03	100
Total	157	72	-	85	-

Table 4 shows, in the clean operation which were infected, the gram positive cocci were the main causative agents in this study. Staphylococcus aureus was isolated in 19 cases (61.3%) and coagulase negative staphylococci in 10 cases (55.5%) of the clean procedures. The enteric gram negative bacilli were the predominant organisms in the clean contaminated operations. Of the 35 klebsiella species 24 (68.6%) and of the 24 E. coli isolates, 15 (62.5%) were cultured from clean contaminated procedures. The incidence of pseudomonas was the same in both types of risk classes. Candida albicans was isolated in 3 samples, all of which were cultured from clean contaminated cases.

Table 5 Comparison of pattern of isolates with risk factors

Risk factors	Total	Monomicrobial		Polymicrobial	
		No.	%	No.	%
Risk class clean	38	29	76.3	09	23.7
Clean contaminated	58	23	39.6	35	60.4
Pre-operative	21	14	66.7	07	33.3
Hospitalization Upto 1 day					
1 to 7 days	43	23	53.5	20	46.5
> 7 days	32	15	46.8	17	53.2
Duration of surgery (Minutes):					
0 to 60	46	30	65.2	16	34.8
61 to 120	33	15	45.4	18	54.6
> 121	17	07	29.5	10	70.5

Table 5 shows, the pattern of isolates were compared with risk factors. There was increased incidence of poly-microbial etiology in the clean contaminated wounds. In the clean cases 29 sample (76.3%) yielded.

Table 6 antibiotic sensitivity of gram positive isolate

Organism	No	Am		Cz		P		Do		G		Ak		Cf	
		No.	%	No.	%	No	%	No	%	No	%	No	%	No	%
S. Aurens	31	18	58.1	21	67.8	10	32.2	18	58.1	19	61.3	23	74.2	17	54.8
Cons	18	11	61.1	14	77.8	12	66.7	11	61.1	12	66.7	13	72.2	13	72.2
Diphtheroids	05	04	80	05	100	04	80	05	100	05	100	05	100	04	80
S. Pyogenes	02	02	100	02	100	02	100	02	100	02	100	02	100	02	100
Enterococci	02	01	50	02	100	01	50	02	100	02	100	02	100	02	100

Table 6 shows, the gram positive isolates were tested against Ampicillin (Am) Methicillin (Cz) Penicillin (P) Doxycycline (Do), Cefazolin (Cf), Gentamycin (G), Amikacin (Ak) and Ciprofloxacin (Ci) Oxacillin was included for Staph, aureus strains. The isolates were highly sensitive to Amikacin (>72.2%) and Cefazolin (>67.8%). Of the 31 staphylococci aureus isolates, only 10 (32.2%) were sensitive to Penicillin, 21 (67.7%) to Methicillin, 23 (74.2%) to Amikacin. Among the coagulase negative staphylococci least sensitivity were recorded to Ampicillin and Gentamycin (>61.1%)

DISCUSSION

In the present study of 114 clinically suspected SSI, 96 yielded aerobic bacterial growth accounting for a total of 157 organisms. Mono-microbial isolates were encountered in 52 (54.4%) of the wounds, 44 wounds (45.8%) yielded polymicrobial agents, Gram positive and Gram negative organisms were frequently involved in the mixed infections. Staphylococcus aureus and E.Coli were the commonest combination present in 7 cases (15.9%). Similar spectrum of organisms was observed by Giacometti, et al, who isolated 1060 bacterial strains from 614 individuals.¹¹

In the present study, on direct microscopy 84.2% samples yielded growth on culture and this finding was in consistent with study of Anvikar et al.¹² Few pus cells and no organisms were seen in culture positive. This, may be probably due to low number of organisms which could not be detected by microscopy but, yielded growth on culture. Similar spectrum of organisms was observed by Giacometti, et al and Olson, et al.^{16,17} Gram negative bacilli accounting for 61% of the isolates, as the principal offenders of surgical wound infection. Anaerobic organisms were not isolated on culture, probably because the patients were treated with prophylactic and therapeutic antibiotics against anaerobes. The clean wound category with no obvious source of contamination, 65.8% of the cultured infected wounds were of monomicrobial etiology. The isolates when compared with the duration of surgery, it was found that with longer durations of surgery, the wound was infected with polymicrobial agents. The incidence of Klebsiella, E.coli and Pseudomonas increased with longer durations of surgery. This suggests that the organisms might be transferred to the wound by prolonged contact with the operating staff and equipment, as airborne spread of the Gram negative organisms is rare.^{15,18}

There is a change in the bacterial etiology of surgical infections from time to time. A century ago, the most feared and frequent pathogen was Streptococcus, twenty years ago the Coagulase positive staphylococcus was the

principal offender, Gram negative bacilli are now replacing staphylococcus.^{3,13,14}

The antibiogram pattern of the isolates shows that Klebsiella was most sensitive to Ceftriaxone (68.6%), Cephalexin (62.8%) and Amikacin (62.8%). The percentage of sensitivity has shown a decline when tested for the other commonly used drugs. E.coli was found to be highly sensitive to Ceftriaxone and Amikacin with 83.3%, Cephalexin and Ciprofloxacin with 75%. Multidrug resistance in case of Acinetobacter species was found to be much higher, probably because it was a hospital strain. This pattern of antibiotic sensitivity correlates with the study of Anvikar et al.¹² All the isolated staph aureus is found to be beta lactamase positive (100%). The resistance of the Staphylococcus aureus strains to Penicillin (68.8%) and Methicillin (25.8%) correlates with the study of Durmaz et al.¹⁹

CONCLUSION

The present study that was conducted in Gauhati Medical College Hospital, Guwahati has enlighten the relationship between SSI, preoperative hospitalization and duration of surgery. There was increase in the incidence of infection, in patients with longer preoperative hospitalization and longer durations of surgery. There was an increase in poly-microbial etiological agents in these cases. Klebsiella was found to be the main etiological agent followed by E coli, Pseudomonas, Coagulase negative staphylococci etc. It was observed that the gram negative bacilli were the main offenders in clean contaminated operations, in patients with longer preoperative hospitalization and in surgeries with increased duration. Most of the isolates were resistant to the commonly used antibiotics. Based on the above observations preventive and prophylactic measures a reducing the pre-operative stay to minimum, minimizing the length of operation, treating infection present at other sites on the patient, using a good surgical technique. Encouraging efforts in reducing the known risk factors to a bare minimum in elderly patients. Antibiotic sensitivity test results for appropriate antibiotic

therapy, to avoid emergence of resistant strains can be enhance to lower down the incidence of post operative wound infection (SSI).

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ORIGINAL RESEARCH PAPER

Pattern of poisoning in autopsy cases reported to civil hospital Ahmedabad- a retrospective study

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ABSTRACT

Introduction: Poisoning is prevalent in all parts of India but trend of poisoning varies from place to place. The word poison has evolved from the Latin word 'potion' which means to drink for health but by the time, the definition has been changed to its present form as any substance which when administered, inhaled or ingested is capable of acting deleteriously on human body. **Materials and methods:** The retrospective study has been carried out in the department of forensic medicine and toxicology, B. J. Medical College, Civil Hospital, Asarva, Ahmedabad during the period of 01 year from January 2017 to December 2017 to find out the distribution according to alleged history of poisoning as per inquest, condition of gastric mucosa, smell from stomach contents, viscera preservation, analytical result and distribution of cases according to cause of death. **Results:** 48.67% autopsy cases of poison are unknown as per the inquest therefore proper antidote could not have been given. More cases are having congested (51.66%) & haemorrhagic (24.50%) mucosa. Chemical analysis for viscera preservation shows in 61 cases (40.39%) compound was detected and in 54 cases (35.76%) were undetected and 9 cases (5.96%) where report is still awaited. aluminium phosphide poison is most common (30 cases, 19.87%) from chemical analysis reports, very closely followed by organophosphorus compounds poison (27 cases, 17.88%). Cardiorespiratory arrest is the most common cause of death in the present study. **Conclusion:** In maximum cases poison being unknown contributing to more fatality therefore bed side analytical test and toxicological analysis set up and strict control over poison substance sale is highly required.

Keywords: Unknown alleged history of poisoning Aluminium phosphide; cardio-respiratory failure.

INTRODUCTION

Poison is a substance (solid, liquid & gaseous), which if introduced in the living body, or brought into contact with any part thereof, will produce ill-health or death, by its constitutional or local effects or both.¹ Anything can be poison; a medicine in a toxic dose can act as poison whereas a poison in small dose can act as medicine. Poisoning is prevalent in all parts of India but trend of poisoning varies from place to place. the word poison has been evolved from the Latin word 'potion' means to drink for health and that by the time, the definition has been changed to its present form as any substance which when administered, inhaled or ingested is capable of acting deleteriously on human body.²

In all unnatural deaths, cause of death being not clear, poisoning remains the probable cause in minds of investigating officers as well as in the minds of the autopsy surgeon. When death occurs by some other means, as in

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homicidal and suicidal cases, poisoning is an important associated feature, in some cases.³ Poisons are silent weapons, which can be easily used without arousing suspicion and often without violence in expert hands.

Since the origin of the mankind, poisoning always remains associated with it, though it was mostly accidental in nature in the earlier times.⁴ People started using for homicide as well suicide. The incidence of poisoning is increasing because of its low cost, easy availability without any restrictions, comparatively small fatal dose and almost sure death. In India, there is no strict control over the sale and storage of poisons.

The present study was conducted by keeping aims as to study the manner of death of poisoning cases and to study the common prevalent poison in poisoning cases.

MATERIALS AND METHODS

This retrospective study has been carried out in the Department of Forensic Medicine and Toxicology, B. J. Medical College, Civil Hospital, Asarva, Ahemdabad during the period of January 2017 to December 2017. All the alleged human poisoning cases brought for medico legal autopsy and cases that were diagnosed as poisoning after autopsy were selected.

Detailed information of the deceased concerned to the case was collected from the relatives or attendants of the deceased, from concerned police officers and hospital case papers. Detailed and complete post mortem examination including chemical analysis of viscera was done to reach cause of death.

All cases with the alleged history of poisoning, diagnosed cases of poisoning after complete post mortem examination and Confirmation from chemical analysis reports were included for the period January 2017 to December 2017.

RESULTS

The findings of the present study were depicted as below

Table 1 Distribution of cases according to alleged history of poisoning as per inquest

Poison Group	No. of cases	Percentage
Corrosive substance	31	20.53%
Aluminium phosphide	21	13.91%
Organophosphorus	10	6.62%
Kerosene	4	2.65%
CuSO ₄	2	1.32%
Scorpion bite	2	1.32%
Snake bite	4	2.65%
Unknown insect bite	2	1.32%
Drug overdose	2	1.32%
Sedative	1	0.66%
Alcohol	3	1.99%
Ganja	1	0.66%
Unknown	75	48.67%
Total	151	100%

Present study shows that in majority of cases (75 cases, 48.67%) exact compound consumed could not be known. In known cases, acid/corrosive were most commonly used (31 cases, 20.53%) followed by aluminium phosphide (21 cases, 13.91%) and Organophosphorus compound (10 cases, 6.62%) respectively. Corrosive substance being useful in household activities making their easy availability can be the reason for involvement in maximum cases (**Table 1**).

Table 2 Distribution of poisoning cases according to condition of gastric mucosa

Gastric mucosa	No. of cases	Percentage
Congested	78	51.66%
Congested + haemorrhagic	37	24.50%
Corrosion	22	14.57%
Healthy	11	7.28%
Gastrostomy	3	1.99%
Total	151	100%

Present study shows that in 78 cases (51.66%) the mucosa of the stomach was congested. Majority of victims were hospitalised and have received treatment which may have lead degradation of the poison. In 37 cases (24.50%) the mucosa of the stomach was congested and haemorrhagic suggesting severe mucosal damage by deadly poisons with erosive effect over mucosa. Whereas in 22 cases (14.57%) were encountered where corrosive effect were present over gastric mucosa (**Table 2**).

Table 3 Distribution of cases in reference to preservation of viscera

Chemical analysis	No. of cases	Percentage
Positive	61	40.39%
Negative	54	35.76%
Awaiting	9	5.96%
Not preserved	27	17.88%
Total	151	100%

Out of total 151 cases during study period, chemical analysis was asked for in 124 cases (82.12%). Out of which, in 61cases (40.39%) compound was detected and in 54 cases (35.76%) were undetected and 9 cases (5.96%) where report is still awaited (**Table 3**).

The reason for non-detection of poison in viscera with alleged history of poisoning can be explained as it may be neutralised during treatment or denatured and it also depend upon the time interval between preservation of viscera to arrival at forensic laboratory.

Table 4 Distribution of cases according to type of poison detected by chemical analysis

Type of poison	No. of cases	Percentage
Organophosphorous	27	17.88%
Aluminium phosphide	30	19.87%
Kerosene	1	0.66%
Organo chlorine	1	0.66%
Carbamate	1	0.66%
HCL acid	1	0.66%
Total	61	100%

Present study shows that out of positive 61 cases of chemical analysis, aluminium phosphide is most common (30 cases, 19.87%) from chemical analysis reports, very closely followed by organophosphorus compounds (27 cases 17.88%) (Table 4).

Table 5 Distribution of cases according to post mortem reports and cause of death

Mode	Compound/Agent	No. of cases(out of 151 cases)	Percentage
Cardio-respiratory failure	Aluminium Phosphide	30	19.87%
	OP	27	17.88%
	Corrosion	25	16.56%
	Suggestive of poisoning	23	15.23%
	Organo chlorine	1	0.66%
	Cuso4	2	1.32%
	Carbamate	1	0.66%
	HCL acid	1	0.66%
	Snake bite	2	1.32%
Shock Respiratory failure	Scorpion sting	1	0.66%
	Stomach perforation	2	1.32%
	Kerosene	1	0.66%

In present study, Aluminium phosphide is most commonly encountered poison (30 cases, 19.87%) leading to maximum fatalities, very closely followed by organophosphorus compounds (27 cases, 17.88%) and corrosive substance (25 cases, 16.56%). According to history of alleged poisoning, corrosive substance were most common but after detailed post-mortem examination and chemical analysis reports, it is concluded that majority of victims died of aluminium phosphide poisoning. 23 cases (15.23%) were encountered where death was attributed to poisoning on the basis of post-mortem findings, exclusion of other pathology and history of poisoning as per inquest and case papers though chemical analysis revealed no poison in viscera (Table 5).

DISCUSSION

Gupta BD et al⁵ and Varma NM et al⁶ preserved viscera in 87.1% and 85.3% of cases respectively. To find out the type of poison chemical analysis is the necessity, even in routine cases, chemical analysis is necessary to rule out presence of poisons because poisons are silent weapons, which can be easily used without causing violence and without arousing suspicion. Being an agricultural based country, most commonly use and easily availability without restriction of these compounds can contribute to maximum involvement in poisoning case. Gupta BD et al⁵ reported insecticides (53.79%) as majority from chemical analysis reports followed by aluminium phosphide (10.60%) and only 7.57% of cases where poison could not be detected and Varma NM et al⁶ in his study observed, Monochrotophos (19.68%) being most common followed by aluminium phosphide (18.86%).

Vishal Garg et al⁷ has also reported aluminium phosphide poisoning (36.8%) as leading cause followed by insecticides (31.6%). Kartik Prajapati et al⁸ from Ahmedabad, Tandon et al⁹ from Agra and N.K Agarwal et al¹⁰ from Delhi has reported Aluminium phosphide in 20% of cases, 33.33% of cases and 38% of cases respectively.

Whereas Gupta BD et al⁵ and Zine et al¹¹ from Nagpur has reported organophosphorus poisoning more common in their study with 62.24% of case and 21.28% of cases respectively.

CONCLUSION

Aluminium phosphide poisoning was the leading cause of death with easy availability without restrictions, cheap minimal fatal dose, no antidote and agricultural usefulness. Organophosphorus poisoning was the second most common poisoning causing fatalities. Maximum cases were from rural areas having farming back ground with usage of insecticides. There should be restriction of poisoning compound from being easy available from market and prior approval for use should be taken from authorised centres and proper records of their sale should be maintained by the retailers. Education regarding proper storage and use of household products and medicines should be given with strict supervision at home keeping away from the reach of children and young adults. Proper psychological counselling should be carried out among the vulnerable group of people. A toxicology lab should be established at the level of community health centre and all teaching medical institute for analysing common prevailing poisons like aluminium phosphide and insecticides. The problem of poisoning has been and is going to exist with human society, so more studies are required for stoppage of this developing threat.

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Contribution of authors: We declare that this work was done by the author(s) in this article and all liabilities pertaining to claim relating to the content of this article will be borne by the authors. The study was conceived and designed by Dr Manjit Nayak. Data collection and analysis by Dr Manjit Nayak, Dr Vanraj Rathva & Dr H.T. Khubchandani.

Author declaration: (1) The article is original with the author(s) and does not infringe any copyright or violate any other right of any third party. (2) The article has not been published (whole or in part) elsewhere, and is not being considered for publication elsewhere in any form, except as provided herein. (3) All author(s) have contributed sufficiently in the article to take public responsibility for it and (4) all author(s) have reviewed the final version of the above manuscript and approved it for publication.

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ORIGINAL RESEARCH PAPER

Histology of seeds: sprouting the neurons for diagnosis of poisoning

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ABSTRACT

Introduction: The regulated and recommended consumption of different plants is for nutrition but, their irrational use either by accident, suicide or homicide can lead to illness, disease or even death in certain cases and is considered as poisoning. It is extremely difficult to detect the biological poisons at the laboratories in the samples collected from the patient. Its physical characteristics and histological features are useful in diagnosis. As per best of our knowledge, no database is available regarding the physical and histological characteristics of routinely consumed toxic seeds in biomedical literature. An attempt is made to prepare a pictorial database of physical and microscopic characteristics of frequently consumed seeds of toxicological significance in Gujarat region. **Materials and methods:** Toxic seeds commonly encountered in poisoning cases, procured from the local shop, were subjected to conventional method of tissue processing at Histopathology laboratory. The slides were examined under light microscope and photographs were captured. The photographs were processed in Microsoft office picture manager software and were reproduced with better resolution. **Results:** The images of the histological features of different seeds were produced and the characteristic features were identified. **Conclusion:** A pictorial database of histology of toxic seeds commonly causing poisoning in the Gujarat region is created. It is suggested to the Forensic Medicine departments in different medical colleges to carry out such exercise to create their regional database. Better images of histological features can be produced by using standard method of processing of toxic seeds in sophisticated Botanical laboratories & area of Forensic Botany can be explored further.

Keywords: Biological poison; forensic Botany; toxic seeds.

INTRODUCTION

Nature has provided a lot of blessings for its creations in this world. Food is one of its blessings for the survival of the living. The plants have served as a good source of nutrition to not only the human beings but also the other creatures on this planet. Different parts of certain plants are very frequently consumed by human beings for nutrition purpose. The recommended and regulated consumption of such eatables is for nutrition, but irrational use of them by accident, suicide or homicide can lead to illness, disease or even death and is considered as poisoning. It is extremely difficult to detect the biological poisons at the laboratories in the samples collected from the patient. Its physical characteristics and histological features may play a key role in diagnosis of poisoning when these poisons are brought by the relatives of the patient or the remains of the poisons are found in the gastric lavage. As per best of our knowledge, no database is available regarding the physical and histological characteristics of routinely used/abused toxic seeds in biomedical literature. This kind of information which can serve as a single point ready reference is not available in a single compiled piece of literature or book,

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even in botany. The authors have tried to prepare a pictorial database of histology of toxic seeds in the constrained set up of a medical college as compared to the sophisticated infrastructure for processing of the seeds available in the departments of botany elsewhere. But in spite of the limitations, the results obtained and recorded by the authors surprisingly approach the standard results in a standard set up. The study aims a) to create a pictorial database of histology of toxic seeds commonly causing poisoning, for their identification to aid in diagnosis b) to establish a histological confirmation of commonly encountered toxic seeds as a helpful adjunct to their identification based on their physical and clinical features and c) to check the utility of conventional method of tissue processing for histology of toxic seeds.

MATERIALS AND METHODS

Various toxic seeds were procured from the local shop. They were identified by gross features. Those included are seeds of 1) Poppy 2) Datura 3) Moringa oleifera 4) Argemone mexicana 5) Semecarpus anacardium 6) Abrus precatorious, 7) Strychnos nux vomica 8) Croton tiglium 9) Capsicum annum and 10) Jatropha curcas.

The seeds were subjected to conventional method of tissue processing¹ at Histopathology laboratory in our hospital, were stained with Haematoxylin & Eosin (H&E) and slides were prepared. The slides were examined under light microscope in various magnifications (10X, 40X) and photographs were captured. The photographs were processed in Microsoft office picture manager software and were reproduced with better resolution.

RESULTS

Following are the images of the histological sections prepared out of the ten toxic seeds (**Figure 1 to Figure 15**). Sections of Poppy seed in **Figure 1** and **2** show coating layer - testa, slightly curved embryo and cotyledons. Section of Datura seed in **Figure 3** shows outwardly curved embryo and thick walled lignified cells around it. **Figure 4** shows section of Moringa oleifera seed with testa represented by tangentially elongated cells followed by thin walled cells from outer to inner side. Cotyledon is made up of parenchymatous cells with oil globules within. Section of Argemone Mexicana seed in **Figure 5** shows outer coating layer with flat cells and embryo in the centre. **Figure 6** depicts section of Semecarpus anacardium seed showing outermost elongated, lignified cells of pericarp followed by mesocarpal parenchymatous cells with lysigenous cavities. Inner to these layers are layer of thin testa and parenchymatous cotyledon. **Figure 7** and **8** are representing sections of Abrus precatorius seed with outermost layer of testa – radially much elongated cells, arranged irregularly followed by tagmen inner to it and innermost parenchymatous cotyledon with vascular network within it. Section of seed of Strychnos Nux vomica

in **Figure 9** is showing collapsed parenchymatous cells of testa with brownish contents and thick walled, cellulosic polyhedral cells of endosperm inner to it. **Figure 10** and **11** are representing the sections of Ricinus communis seed showing cells of testa elongated radially and mesophyl cells with oil globules in the cotyledon. Dicotyledonous curved embryo is visible in section of Capsicum annum seed in **Figure 12** and **13**. **Figure 14** and **15** are depicting sections of Jatropha curcas seed which shows polygonal cells with slit like lumen.

Images of gross appearance of these seeds are not provided due to space constraint. The same can be availed through e-mail to the corresponding author.

FIGURES:

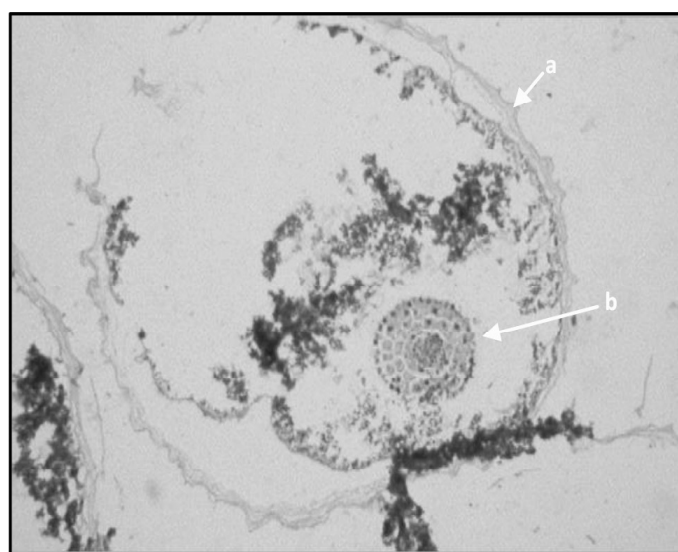


Figure 1 Transverse section of Poppy seed (10X) showing a. Testa, b. Embryo

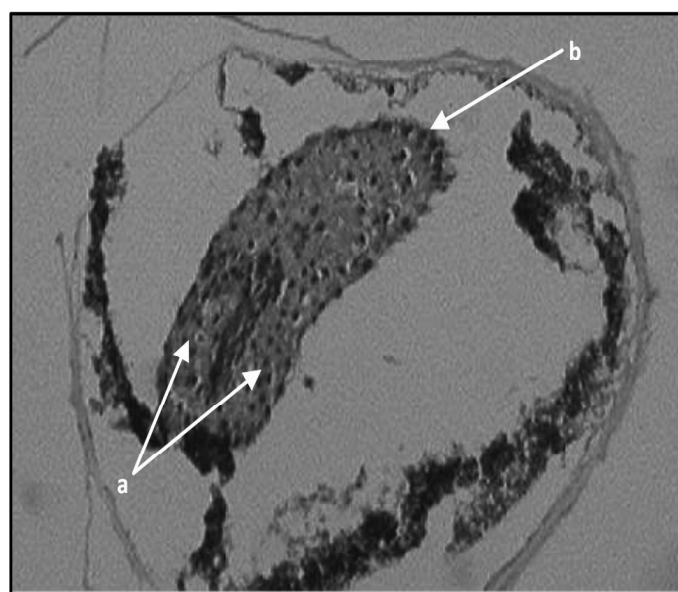


Figure 2 Longitudinal Section of Poppy seed (10X) showing a. Cotyledons, b. Shoot apex

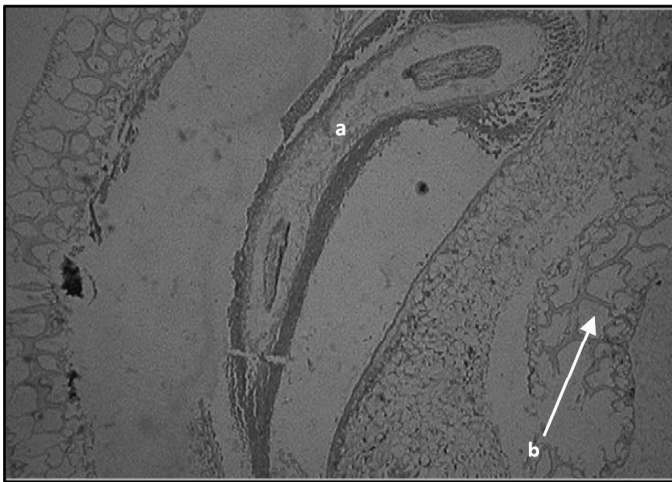


Figure 3 Longitudinal section of *Datura* seed (10X) showing **a.** Curved embryo, **b.** Lignified cells

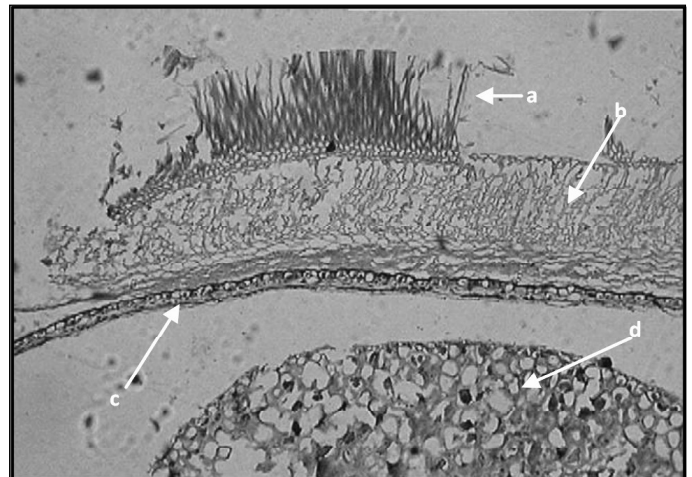


Figure 6 Longitudinal section of *Semecarpus Anacardium* seed (40X) showing **a.** Lignified elongated cells of pericarp, **b.** Mesocarpal parenchymatous cells with lysigenous cavities, **c.** Testa, **d.** Parenchymatous cotyledon

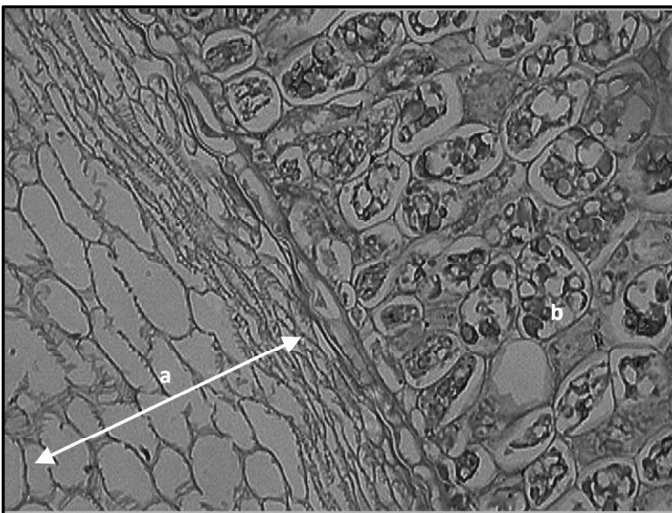


Figure 4 Transverse section of *Moringa oleifera* seed (40X) showing **a.** Tangentially elongated cells followed by thin walled cells of Testa, **b.** Parenchymatous cotyledon cells

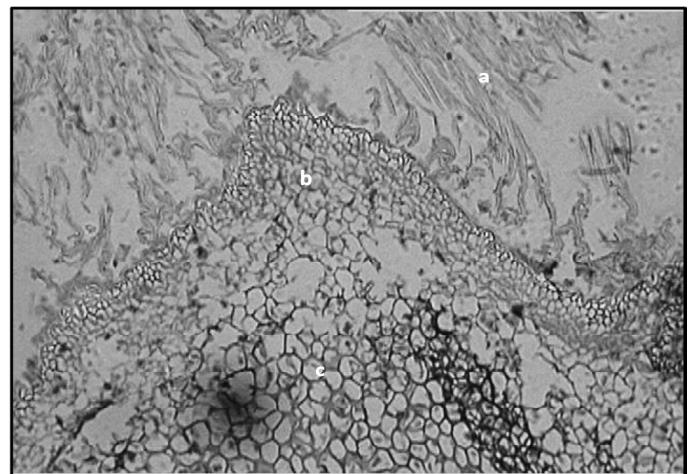


Figure 7 Transverse section of *Abrus Precatorius* seed (10X) showing **a.** Testa, **b.** Tegmen, **c.** Parenchymatous cotyledon

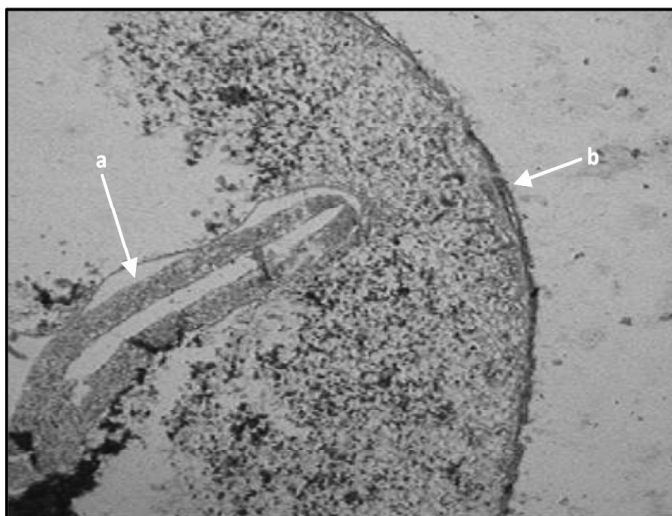


Figure 5 Longitudinal section of *Argemone Mexicana* seed (10X) showing **a.** Embryo, **b.** Collapsed cells of Testa

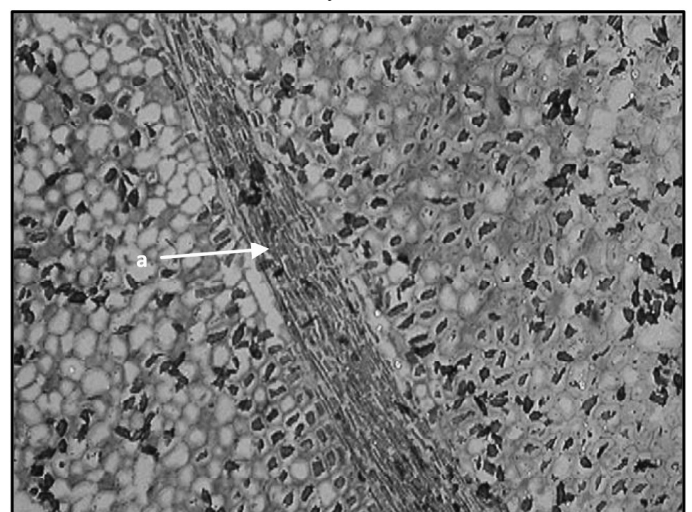


Figure 8 Transverse section of *Abrus Precatorius* seed (40X) showing **a.** Vascular network within cotyledon

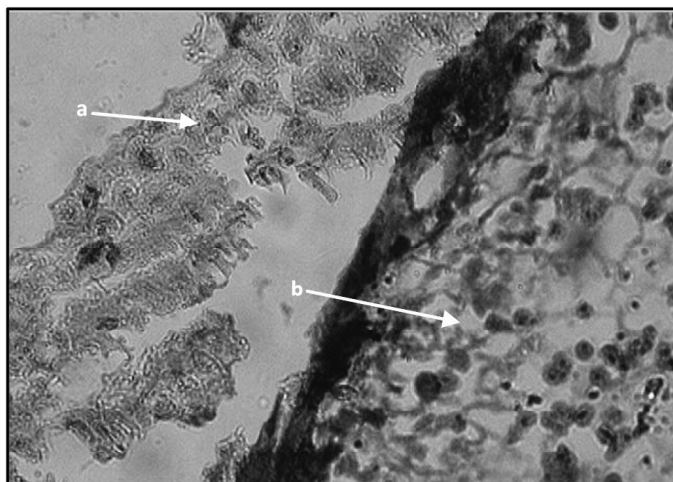


Figure 9 Transverse section of *Strychnos Nux Vomica* seed (40X) showing **a.** Collapsed parenchymatous cells of testa with brownish contents, **b.** Thick walled, cellulosic polyhedral cells of endosperm



Figure 10 Transverse section of *Croton Tiglium* seed (40X) showing **a.** Radially elongated epidermal cells of testa, **b.** Cotyledon

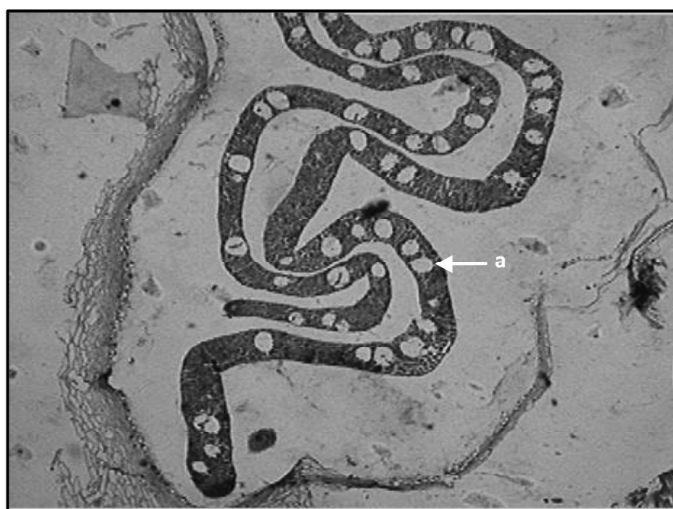


Figure 11 Transverse section of *Croton Tiglium* seed (10X) showing **a.** Cotyledon – Mesophyll cells with oil globules

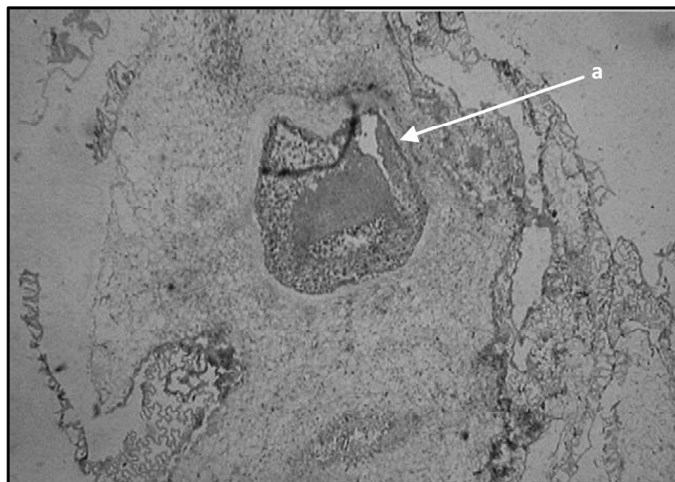


Figure 12 Transverse section of *Capsicum annum* seed (10X) showing **a.** Embryo

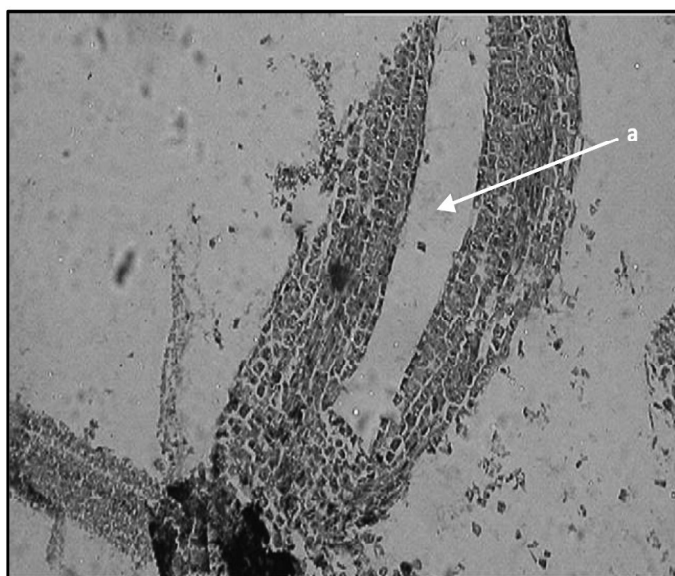


Figure 13 Longitudinal section of *Capsicum annum* seed (10X) showing **a.** Dicotyledonous curved embryo

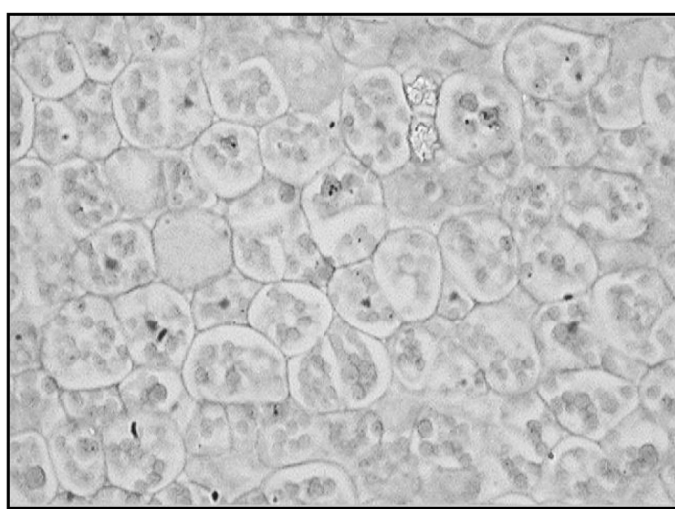


Figure 14 Transverse section of *Jatropha Curcas* seed (40X) showing Polygonal cells with slit like lumen

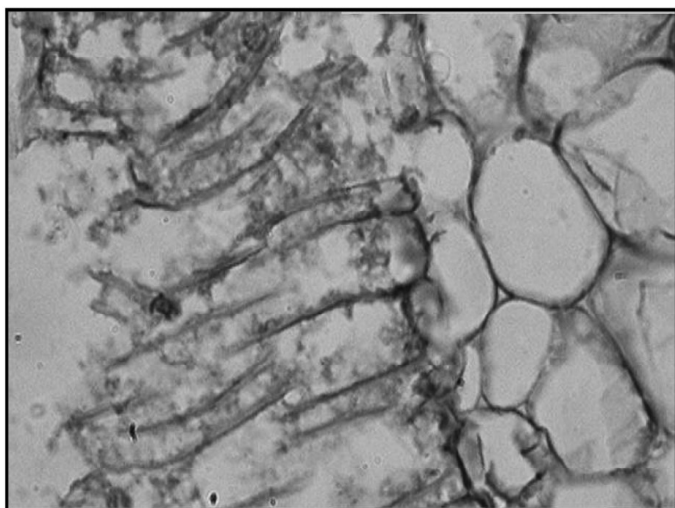


Figure 15 Longitudinal section of *Jatropha curcas* seed (100X – Oil immersion) showing Polygonal cells with thickened walls

DISCUSSION

The authors encountered a case where a pediatric patient consumed unknown seeds and presented with severe vomiting and diarrhoea, where the pediatrician was confused with the diagnosis, but the diagnosis of poisoning with *Jatropha curcas* seeds was confirmed by the exercise of gross as well as histological examination of the seeds brought by relatives of the patient.² This exercise was collaboratively carried out by Pediatrics & Forensic Medicine departments. The authors were encouraged to create a histological database for other toxic seeds commonly causing poisoning in the region by success of the case mentioned in reference 2.

The images of gross physical characteristics of various toxic seeds were found in plenty of literature³⁻⁹ and the features were compared. The authors found compatible literature of histology of some seeds from The Ayurvedic Pharmacopoeia of India¹⁰⁻¹⁴ with which the slides were compared and confirmed, but no references for the images of histological features of these toxic seeds were found. The seeds were subjected to the conventional method of tissue processing at Histopathology laboratory of the hospital which yielded confirmatory results in some, but not all. This might be because the sectioning could not be done properly; which is attributable to the hardness of the seeds, as opposed to the human tissues which have softer consistency. However, the seeds if soaked in alcohol before sectioning can yield better sections. Stains like Safranin & Methylene blue can be better substitutes to H & E stain; & parallel staining with Sudan can help easier identification of lipid filled cells. The standard procedure for sectioning of seeds mentioned by Willard W. Rowlee¹⁵ can yield better results when carried out in a sophisticated Forensic Botany laboratory with compatible instruments and stains for the seeds.

CONCLUSIONS

A pictorial database of histology of toxic seeds commonly causing poisoning in the Gujarat region is created. The seeds brought by the patient or relatives, recovered from the crime scene or by filtering the gastric lavage contents can be collected and their histology can be compared with the database as an adjunct to their physical features for its identification in cases of poisoning with biological poisons where, these poisons are not being able to be detected routinely in Forensic science laboratories. Forensic Medicine departments in different medical colleges are suggested to carry out such an exercise to create their own regional database. Better images of histological features can be produced by using standard method of processing of toxic seeds in sophisticated Botanical laboratories and this area of Forensic Botany can be explored further.

Conflict of interest: None declared.

Ethical clearance: Not required as this study does not involve human participants.

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Author's contribution: We declare that this work was done by the authors named in this article and all liabilities pertaining to claims relating to content of this article shall be borne by the authors. Concept, Design, Manuscript writing by: Dr Mohammed Ziyauddin G Saiyed, Dr Chetan B Jani. Processing of the seeds & identification of the features on sections were done by the authors with the help of personnel mentioned in acknowledgements.

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ORIGINAL RESEARCH PAPER

Introducing flipped classroom to undergraduate students in microbiology

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Received on November 9, 2019; editorial approval on December 9, 2019

ABSTRACT

Introduction: Didactic lectures are teacher centered and passive method of imparting knowledge with minimum ability to stimulate students to understand and apply concepts. Flipped Classroom (FCR) is also known as 'reversed' or 'inverted' classroom. It is a type of blended learning that integrates distance learning outside the class and face to face learning in class. FCR is a learner centered model in which class time explores topics in greater depth and creates meaningful learning opportunities. **Materials and methods:** FCR model was introduced, as a teaching learning method to undergraduate students in teaching Microbiology and feedback was taken from Students and Faculty through validated questionnaires. **Results:** A total of 84 second year UG students participated in this study. Overall positive responses were received from the students and faculty for Flipped Classroom teaching. On analysis of student's feedback, students (83.3% n=70) wanted this Flipped classroom technique to taken for future classes. Moreover, 84.5% (n=71) students agreed that Flipped Classroom was useful for studying Microbiology which is otherwise is a difficult subject to retain. Overall 85.7% faculty in our department was keen to introduce FCR for future classes in Microbiology. **Conclusion:** FCR has been useful in studying Microbiology with prime objectives of motivating undergraduate students and cultivating skills of self learning. The class time can be utilized to develop their applied knowledge and instill critical thinking among the students. In the newly introduced CBME curriculum, the student centric approach can be well justified by Flipped Classroom as a beneficial teaching learning method.

Keywords: Student centric approach; self directed learning; blended learning.

INTRODUCTION

Didactic teaching sessions occupy a large proportion of the available teaching-learning time in medical courses. This form of teaching usually takes the form of a lecture delivered by an expert to a group of students. The size of the student group differs in various milieus and decides the aids used in teaching; these may include a chalk and board, computer aided slide projection systems and audiovisual aids. The students' role is reduced to listening, recording or making notes, with opportunities for questioning and interaction usually being relegated to the concluding minutes of such a session. The teacher is obviously unable to meet the varying demands of each student during such a session.¹ Attempts to put the available teaching-learning time to better use and address the needs of students by increasing active involvement in the teaching-learning process led to the evolution of the 'Flipped Classroom' (FCR) or 'inverted classroom' approach.² In this model, the activities carried out during traditional class time and self-study time are reversed or 'flipped.' It is a type of blended learning that integrates distance learning outside the class and face-to-

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face learning in class.³ FCR is a technique that was introduced by Jonathan Bergmann and Aaron Sams in early 2000 where they delivered their lectures as video records for students to watch at home and the students did more constructive activities during freed class time.⁴ According to Bergman and Sams, students need assistance of teachers to answer questions and when solving problems in an assignment but not when listening to a lecture.² With the advancement of technology in the new millennium, where students have access to information at the tip of their fingers, the importance of lectures keep diminishing in adult education. Newer technologies make it easier for educators to adopt innovative ideas such as flipping the classroom that allow students to access and study lectures at their own pace. Freed class time would allow teachers to engage in techniques that involve students in higher order cognitive work.⁵

Although such an approach could be implemented in many ways, it usually involves students preparing for class by watching a pre-recorded lecture or undertaking assigned reading activities. The class time is used for interactive discussion or problem-solving. Thus, the role of the teacher shifts from being the 'sage on the stage' to the 'guide by the side'.⁶ There is evidence to demonstrate that students taught via this approach are more aware of their own learning process. This awareness would allow for adjustments pertaining to their activity and focus in order to perform optimally in the course.⁷

The Flipped Classroom provides scope for interactive teaching i.e. additional face-to-face interaction time with students in the classroom by minimizing the amount of direct instruction used in a traditional classroom setting thus giving opportunity to the students to participate actively through discussions or problem solving.⁸ It is one of many methods adopted in the broader blended learning domain where students move between learning modalities.⁹

In contrast to traditional classrooms where class time is filled with instruction and assimilation followed by homework to consolidate learning, Flipped Classrooms reverse classroom content and homework. Thus 'first exposure' occurs before class and work typically done as homework is undertaken in class with instructor guidance.^{10,11} Time is a scarce learning resource and the most often cited benefit of flipping classrooms is that it frees in-class time for other activities.¹² In terms of Bloom's revised taxonomy this too is 'flipped', with lower level cognitive work undertaken outside of class and in-class activity focused on higher levels of cognitive work in a peer/instructor supported environment.¹³ The Flipped Classroom is thus a student-centred learning approach where in-class time can be dedicated to more effectively engage in active learning of

relevant discipline concepts, exploration of topics in greater depth and creating richer learning experiences and there is increased opportunity for teacher-to-student mentoring and peer-to-peer collaboration.

Objectives of the study were to introduce Flipped Classroom to undergraduate students in Microbiology; to sensitize the Faculties and Students to Flipped Classroom model and to obtain feedback from Students and Faculties regarding their perception and experience of the Flipped Classroom model.

MATERIALS AND METHODS

The study was carried out in the department of Microbiology, Jorhat Medical College, Jorhat, Assam. The population involved were Undergraduate students and Faculties of Department of Microbiology. Prior permission was taken from Institutional Ethical Committee (IEC). At the outset a meeting was organized with Head of Department and faculties of the department of Microbiology in order to sensitize about the concept of Flipped Classroom. Subsequent meetings of faculty were conducted to introduce FCR in microbiology classes. The details of methodology including pre class and in class activities were explored. The topic 'Herpes Virus' was selected and outline of study was formulated. Student feedback questionnaire with both closed and open ended questions was prepared and peer validated. For closed ended questions, a 5-point Likert scale was used. Students were also sensitized about the method. They were informed about the study in details and then informed written consent was obtained. They were asked to make a WhatsApp group for receiving instructions and link of online material. A power point presentation was prepared on 'Herpes Virus' and few references regarding the topic were distributed through that WhatsApp group one week prior to the scheduled class. Students were instructed to study the topic themselves with the help of the references along with text book material from a designated standard book. After one week, the in class activities was conducted in two scheduled classes of an hour each. All the students were divided into ten small groups where each group was given problem based questions and MCQs to solve regarding the topic. Each group was guided by faculty as facilitators. The students discussed the solutions in their groups. Then each group presented their assignments in the large group. The students were also encouraged to clarify the doubts by asking questions at the end of each presentation. Immediately after the two classes, student's feedback was taken through questionnaire. Feedback from Faculty was also taken.

RESULTS

Out of all hundred students, eighty four students participated and have filled up the feedback forms. Seven faculty gave their feedback. Based on the analysis of the feedback forms the following observations were seen.

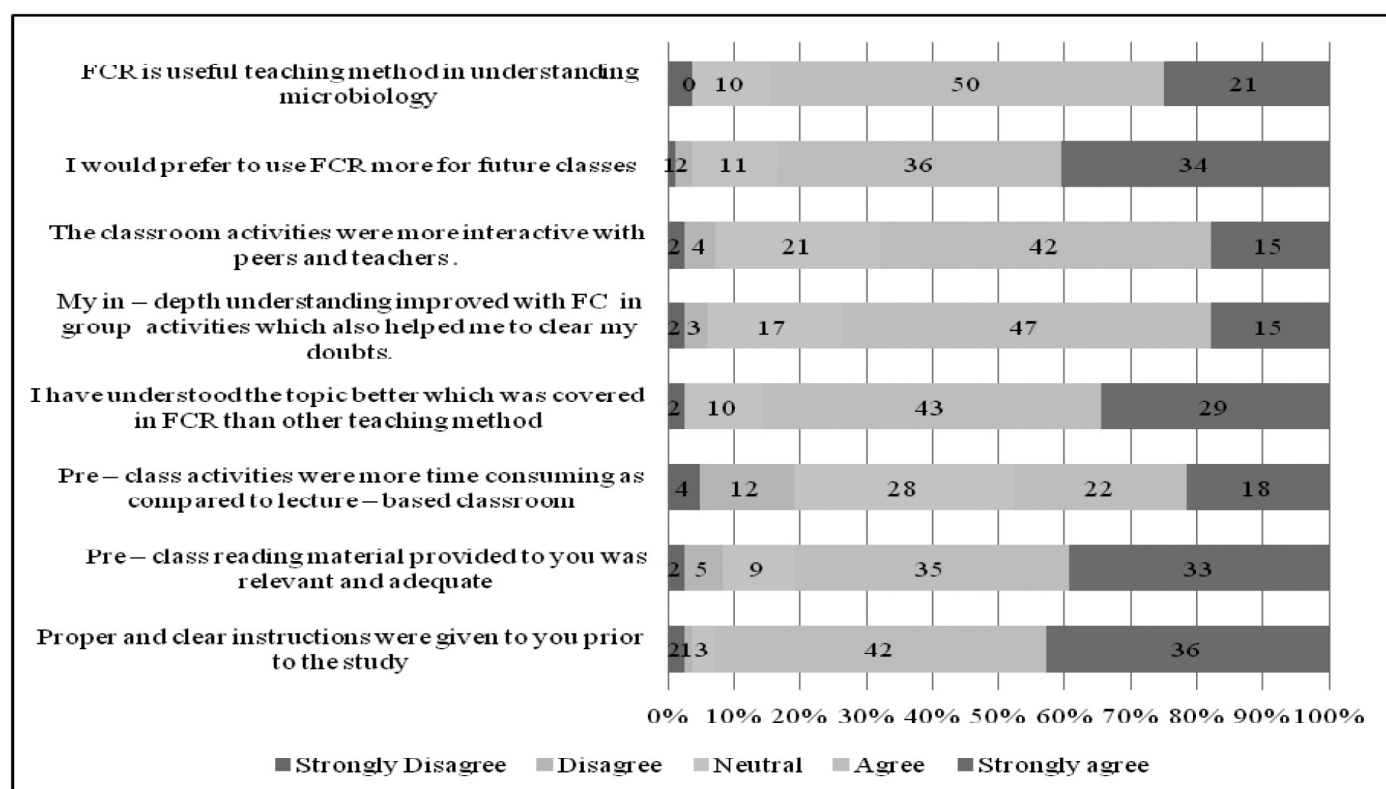


Figure 1 Students feedback on FCR

On analysis of students' feedback (Figure 1), 80.9% (n = 78) revealed that the pre class materials provided to them were adequate and sufficient and 47.61% (n = 40) found that it was not time consuming as the students found it easy to study at their own pace. The topic was better understood by 85.7 % (n=72) students through FCR. The students (73.8%) (n = 62) found that group activities helped them to clear their doubts. The students (67.8%, n = 57) found that they can interact more with peers and facilitators than didactic lectures. The students (83.3% n = 70) wanted this FCR for future classes. At last, 84.5% (n = 71) students agreed that FCR was useful for studying Microbiology which is otherwise a difficult subject to retain.

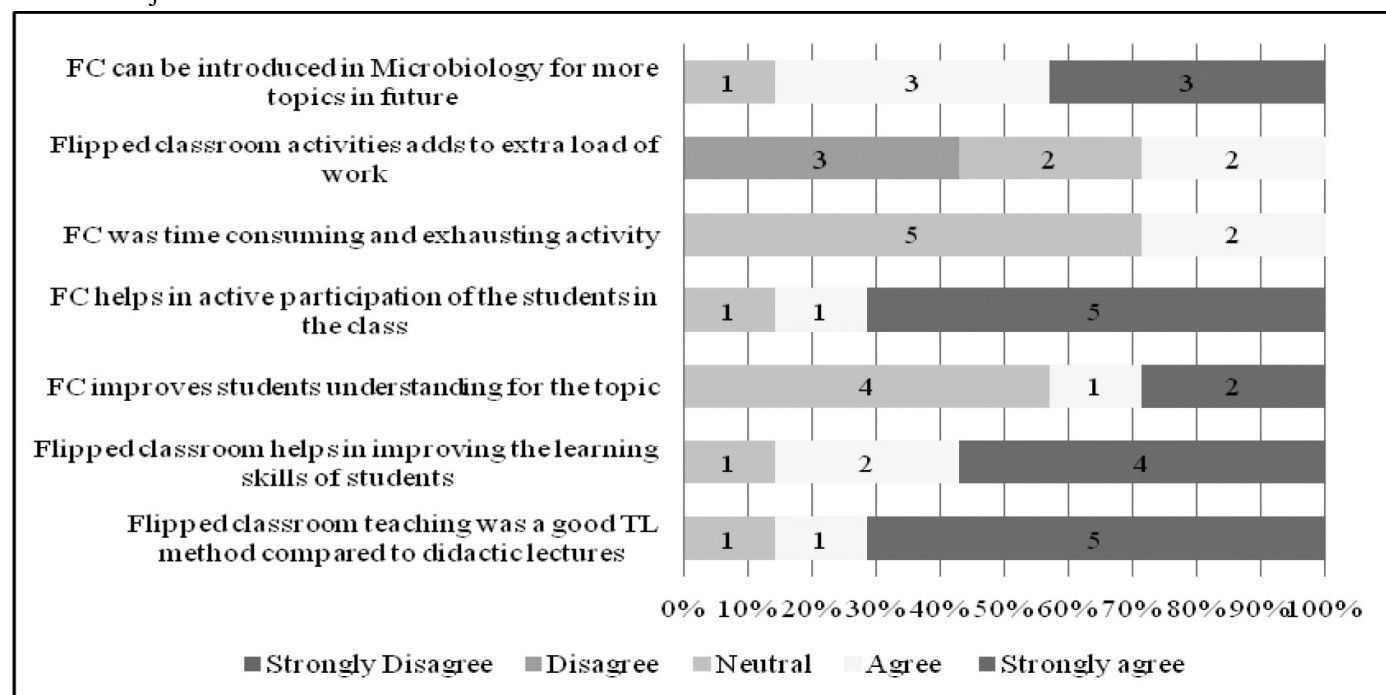


Figure 2 Faculty feedback on FCR

On analysis of faculty feedback (**Figure 2**) it was found that 71.4% (n = 5) faculty felt FCR was a good teaching learning method compared to didactic lectures. Maximum faculty 85.7 % (n = 6) were of the opinion that self directed learning skill can be improved. Through FCR, 85.7% (n = 6) faculty of the department felt that there was active participation in the class activities as compared to traditional teaching . Faculty 71.4% (n = 5) had a neutral opinion regarding that FCR activities might be time consuming and exhaustive. Faculty (42.8%, n = 3) disagree that FCR activities will increase work load. Overall 85.7% faculty were keen to introduce FCR for further classes in Microbiology.

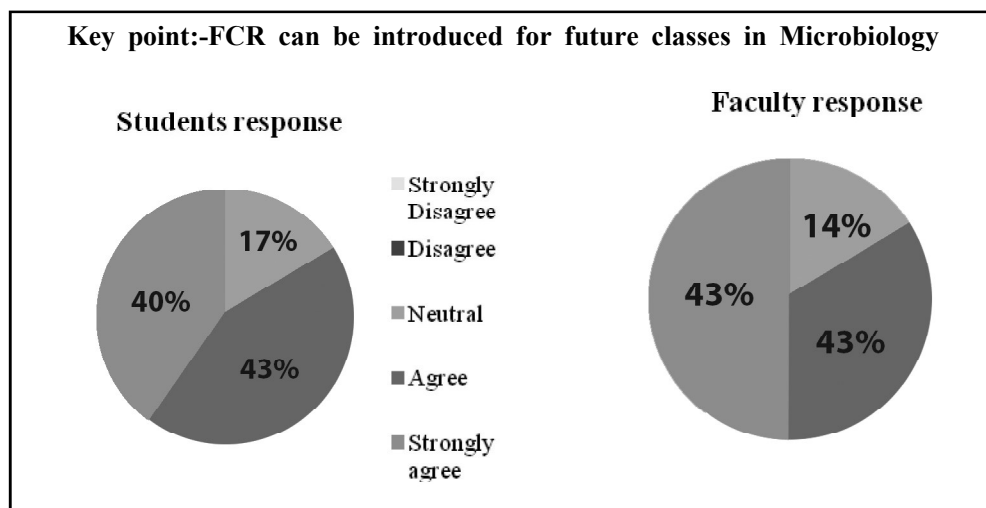


Figure 3 Key Point of Student and Faculty perception for introducing FCR for future classes

The FCR was well accepted by the faculty as well as the students and both (85.7% faculty and 84.5% students) recommended that it can be introduced for teaching Microbiology (**Figure 3**).

The following were the responses from the open ended questions:-

Table 1 Responses of students to two open ended questions

Responses of students to two open ended questions	
What did you like the best in flipped class room method?	<ul style="list-style-type: none"> • Prior knowledge of the topic helps to clear the doubts in class. • Motivates self learning. • Interaction between batch mates and teacher was good. • Retention of the topic is more. • Correlation of the topic is better because of pre and in class activities. • Group discussion improves the understanding of the topic. • Did not have to listen to lectures. • Activities could hold attention during the entire class
What did you dislike in flipped class room method and how you would like to improve this further?	<ul style="list-style-type: none"> • Nothing to dislike. In class activities is time consuming. • Difficult to read lecture given through soft copy. • Need reading material as hard copies. • More topics should be covered by FCR. • FCR should be started in other subjects too.

DISCUSSIONS

Although the perceptions of students towards the FCR have been evaluated in several disciplines and at varying levels of learning, such data is not much available for medical students. More specifically, studies on the efficacy of this model in the teaching of Microbiology are only sparsely available.

The noteworthy comments are that it helped them to understand better, active engagement helped them to learn the topic, opportunity to discuss and clarify their doubts with the facilitator. This was possible as much of the material was learnt prior to class. Students agreed that active engagement was consistently encouraged by the instructor and they also realized that good preparation for the class was necessary for an optimal utilization of time. This feedback obtained after the flipped teaching session in this instance mirrors data from study by Pierce R.¹⁴

The key success of this FCR is that students take responsibility for their own learning. This could be perceived as both

an advantage and a disadvantage. Advantages of this approach include an increase in opportunities for interaction between students and teachers, a shift in the responsibility for learning on students, the freedom to prepare for the class at a time that suits them, the opportunity to revise the material as many times as required, the ability to readily archive learning resources, collaborative working between students, an increase in student engagement and a shift from passive listening to active learning. Possible disadvantages include the need to invest time and resources to develop such courses, the possible need for technological investment and time needed for both teachers and students to acquire and adapt to these new skills required is much more.

In this present study it was evident that a majority of the students preferred the FCR to the traditional lecture of teaching. The students were very comfortable with the materials provided to them and that it was not time consuming as the students found it easy to study at their own pace and it also enabled them to have a better understanding of the topic. Visualising and watching the lessons on videos number of times improves the understanding ability. Mahmood et al and Sreegiri et al in their studies attributed to the fact that video lectures provide flexibility in learning and a chance to review and repeat the sessions.^{15,16} Moreover the web sources with references kindled a greater interest to read as compared with didactic lectures. The students also felt strongly that this method provided them with an incentive to actively engage with the topic before the class which was comparable with similar findings which have been reported by other studies.^{1,17,18} Jones & Edwards, 2010; Fulton, 2012; Roehl, et al., 2013 also reported flipped content assists them with their preparation for class independently and at their own pace.¹⁹⁻²¹

Majority of the students in the present study opined that Flipped Classroom method gives better opportunity to interact and communicate with teachers and other students in the class as well as it is more engaging. Students understood the topic better which was covered in Flipped classroom and found that group activities helped them to clear their doubts in this type of teaching learning method. Tucker, 2012; Zappe, et al., Fei, et al. 2013; Lie & Cano, 2001 also found that the class time is more benefitting because clarification of confusing content is possible while discussing the topic.^{13, 22-24} Studies by Nouri and R Veeramani et al also reported that students expressed a positive attitude to flipped classroom agreed that it is easier and more effective to learn with the flipped classroom approach and that they feel more motivated as learners.^{1,17}

In the present study, 83.3% students wanted this Flipped Classroom technique to be taken for future classes. In another study Zhao et al reported that nearly half of the respondents preferred the flipped model.¹⁸ Similarly other

studies S K Gubbiyyapa et al, Veeramani et al, Morgan et al found that student satisfaction was very high and majority of the study subjects considered flipped classroom as effective teaching learning tool and students opined that more such flipped classroom sessions should be organized in the future.^{1,25,26} Similar to our findings, a study conducted at Ripah University, using a similar pedagogy to teach third year MBBS student during clinical rotation, reported that students found FCR as a better mode of teaching in their setup as well.²⁷

Research has shown that the average attention span of a medical student is 15 to 20 minutes and the optimum length of a lecture may be 30 minutes rather than 60 minutes.²⁸ Thus, it is possible than the results of hour-long lectures may be less than optimal. Students can read and learn information on their own, but they need instructors to act as coaches and mentors to stimulate and challenge their thinking, guide them in solving problems, and encourage their learning and application of the material.² In our present study all the faculty involved also had the same opinion that active learning takes place through active participation in the class activities as compared to traditional teaching. Flipping the traditional classroom is both a feasible and necessary move to educate students to reinvent their classrooms in a way that empowers students to develop higher order cognitive skills and to engage in meaningful learning that will ultimately improve the delivery of health care. Evidence also indicates that engaging students in active learning enhances their learning outcomes higher-order thinking, problem solving, and critical analysis and improves their motivation and attitudes.^{29,30}

Finally, it is important to plan and consider the academic time taken to deliver a course using a FCR. The findings and the experience of this study supports the view of other studies that FCR is an effective teaching learning method and student and faculty response were largely positive, indicating it to be an approach worth pursuing in future years and also for the newly introduced CBME (Curriculum Based Medical Education) curriculum where student centric approach is the main theme.

CONCLUSION

The perception of the students in the present study reveals that FCR helped in better understanding and clearing of doubts amongst them and is a good teaching learning method. This student-centric approach creates an environment for interaction and flexible learning. By making the lecture available through online, it encourages self learning in students at their own pace. Use of technology along with individual and group activities in class time adds value to students in depth learning of the subject and also addresses individual learning style and preference. Majority of the students wanted this method to be continued for more topics in the subject. It was also felt by faculty that FCR is

feasible to plan and conduct in undergraduate teaching. With the rolling out of the new CBME curriculum which is a learner centric approach, this FCR model might find a place to instill self directed learning in students and in the long run will help to inculcate the habit of lifelong learner among the Indian Medical Graduate. Therefore this method can be adopted and incorporated in addition to other teaching learning method in the undergraduate teaching.

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Contribution of authors: “We declare that this work was done by the authors named in this article with equal contributions.”

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ORIGINAL RESEARCH PAPER

Postmortem study of histopathological lesions of heart in sudden natural deaths brought to JNIMS, Imphal

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ABSTRACT

Introduction: To study the histopathological lesions of heart in autopsy specimens, that plays a major role as cause of death in sudden natural deaths. **Materials and methods:** A retrospective study was carried out over a period of 5 years i.e from January 2014 to December 2018 in the Department of Forensic Medicine and Toxicology, JNIMS, Imphal. Total 1010 medicolegal autopsies were conducted during this period, out of which sudden natural death was seen in 51 cases. Among the 51 cases, 25 were of deaths due to cardiac cause. **Results:** This study included 25 cases of sudden cardiac deaths. Maximum number of cases was in the age group of 40-50 years. All the cases were males. Grossly, the average weight of heart was between 300-400 grams. Out of 25 cases, the most common cause of death is found to be Coronary insufficiency which constitute 64%, followed by Myocardial infarction (24%), myocarditis (8%) and cardiomyopathy (4%). **Conclusion:** Coronary atherosclerosis as the commonest pathological lesion was found and is the leading cause of death.

Keywords: Atherosclerosis; morphology; myocardial infarction; coronaries.

INTRODUCTION

Death is said to be sudden or unexpected when a person not known to have been suffering from any dangerous diseases, injury or poisoning is found dead or dies within 24 hours after the onset of terminal illness (WHO).¹ Sudden death is an enigma which may occur due to cardiac or extra cardiac causes.² World health organisation has defined sudden death as death occurring within 24 hours from the onset of symptoms. It is reported that concordance between clinical

and pathological cause of death are moderate and autopsy still provides a very important procedure for evaluating causes of death.³

Many a times it has been found that when gross pathology could not help to evaluate the cause of death, Histopathology can conclusively opine the involved cardiac pathology.

MATERIAL AND METHODS

The present study was carried out at the Department of Forensic Medicine and Toxicology, JNIMS, Porompat, Imphal, Manipur from September 2019 to November 2019. Datas were collected from the postmortem reports, of postmortem conducted in the mortuary of JNIMS from January 2014-December 2018 and were analysed. In the present study, 51 heart specimens were sent for histopathological examination. Out of which 25 cases showed pathological changes in the heart.

RESULTS

In the present study 25 cases were considered. Maximum number of cases presented between the age group 40-60 years. All the victims were male. Incidence of sudden death in rural population were more than urban with 17 (68%) and 8 (32%) cases respectively as shown in **Table 1**.

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It was observed that in 52% of the total cases, victims died at their work place followed by the victim's house with 28%. As shown in **Table 2**.

In the present study, in gross finding, it was found that most of the heart weight ranged from 300-400 grams constituting 44%. Atherosclerotic plaque was found mostly in left anterior descending artery(36%). 1%-25% stenosis seen in 40%, 25%-50% stenosis seen in 4%, 50%-75% stenosis seen in 24% and 75%-100% seen in 32% as shown in **Table 3**.

Table No.4 showing the histopathological findings which shows atherosclerosis found to be the most common finding constituting 44% of the total cases followed by myocarditis (8%), atherosclerosis with myocardial infarction and myocardial hypertrophy with atherosclerosis constitute 8% each, 20% of the cases shows no specific findings as shown in the **Table 4**.

The cause of death is found to be the coronary insufficiency constituting 64% of the total cases, followed by myocardial infarction with 24%, myocarditis (8%) and cardiomyopathy (4%) as shown in **Table 5**.

Table 1 Socio demographic profile of victims

Category	Total	Percentage
Age		
Below 10 years	0	0
10-20 years	1	4
20-30 years	0	0
30-40 years	1	4
40-50 years	12	48
Above 50 years	11	44
	25	100
Gender		
Male	25	100
Female	0	0
	25	100
Area distribution		
Rural	17	68
Urban	8	32
	25	100

Table 2 Place of occurrence

Place of occurrence	Total	Percentage
Victim's house	7	28
Victim's work place	13	52
On the way	5	20
	25	100

Table 3 Gross findings

Weight of the heart		
Heart weight	Total	Percentage
300-400g	11	44
>400g	10	40
>500g	2	8
>600g	2	8
	25	100
Presence of Atherosclerotic Plaque		
Blood vessel involved	Total	Percentage
Left anterior descending artery	9	36
Left circumflex artery	2	8
Right coronary	1	4
Both	6	24
No findings	7	28
	25	100
Grades of Narrowing		
	Total	Percentage
1-25%	10	40
25-50%	1	4
50-75%	6	24
75-100%	8	32
	25	100

Table 4 Histopathological findings of heart (microscopic findings)

Findings	Total	Percentage
Atherosclerosis	11	44
Myocarditis	2	8
Atherosclerosis + Myocardial infarction	2	8
Atherosclerosis + Myocarditis	1	4
Findng of heart (Atherosclerosis + Myocardial hypertrophy	2	8
Myocarditis + Myocardial hypertrophy	1	4
Atherosclerosis + Myocardial Hypertrophy + Myocardial infarction	1	4
No specific findings	5	20
	25	100

Table 5 Cause of death

Findings	Total	Percentage
Coronary insufficiency	16	64
Myocardial infarction	6	24
Myocarditis	2	8
Cardiomyopathy	1	4
	25	100

DISCUSSION

Investigations in the cases of sudden death take an important place in forensic practice. The cardiac autopsy is important to study the pathological lesions in the heart. In this study, most of cardiovascular deaths occurred within age range of 41-60 years. Similar findings were reported by Joshi C³, Karanfil R et al,⁴ Stavroula A et al.⁵ This shows that age is a powerful risk factor for heart disease. The development of atherosclerosis increases markedly with age up to an age of about 65.

In the present study, all the victims were males. This again emphasize that male is at greater risk for heart diseases as compared to females. The male dominance was reported by other authors Ozdemir B et al, Thomas AC et al, Shanti B et al, Farb A et al, Chugh SS et al.⁶⁻¹⁰

Community character of sudden death victims in the present study depicted that maximum victims were from rural area (68%) followed by urban (32%). The rural predominance could be due to absence of medical facilities, 1st aid or immediate treatment might not have been given in time as it takes lots of time to reach the hospitals. So large number of death cases are observed in the study. Whereas in Urban area, a good number of medical facilities are available due to the presence of highly advanced medical colleges and hospitals, where large number of experienced doctors are available, patient are given emergency treatment and medication if brought in time.

In our study, marital status of victims revealed that 88% were married followed by unmarried with 12% of total cases.

It was observed that in 52% of the total cases, victims died at their work place followed by the victim's house with 28%.

On gross examination, the average weight of heart as measured was found to be between 300-400 g which contributes 44% followed by more than 400 gram constituting 40%. Findings are consistent with the study done by Porwal V et al¹¹. On gross finding, three vessels involvement was seen in 24%. The most common involved vessel was Left anterior descending artery (36%) followed by left circumflex artery (8%) and right coronary artery (4%). Similar findings are observed in a study done by Porwar V et al.¹¹

In the present study, 1-25% stenosis seen in 40%, 25-50% stenosis seen in 4%, 50-75% stenosis seen in 24% and 75-100% seen in 32%.

In comparison of histopathological findings in our study, coronary atherosclerosis was most common finding present in 44% cases. Similar findings were observed in Joshi C, Karanfil R et al, Stavroula A et al, Ozdemir B et al, Basso C et al, Drory Y et al, Corrado D et al.^{3-6,12-14}

The next common lesion in present study was myocardial infarction and myocardial hypertrophy with atherosclerosis constituting 8% each. Similar incidence was reported by Basso C et al¹² and Wang HY et al.¹⁵ Myocarditis was found in 8% of the total cases. Variable percentage of myocarditis has been reported by different authors Joshi C (9%)³, Ozdemir B et al (7%)⁶, Basso C et al (10%)¹², Drory Y et al (25%)¹³ and Kramer Y et al (29%)¹⁶. The cause of death was found to be coronary insufficiency which constitute 64%, followed by myocardial infarction with 24%.

CONCLUSION

Present study concluded that the most frequent lesion in the heart cases were atherosclerosis. Atherosclerosis was the main cause of myocardial infarctions and sudden death. In sudden deaths, cause of death can be determined by autopsy but routine autopsy procedure is not sufficient. So, in medico legal autopsies, especially for sudden death, it is proposed that every possible organ must be sampled for histopathological examination and must be examined with a multidisciplinary approach (scene investigation, medical history, biochemical, microbiological, toxicological etc) as it provide the most accurate clues to a better understanding of human cardiovascular diseases. The study highlight the need for employing preventive lifestyle modification strategies like stress reduction, healthy diet and regulate exercise especially in the young people. So to conclude, a detailed and meticulous post-mortem examination of whole heart is important to rule out the various aetiologies.

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Source of funding: None.

Contribution of authors: We declare that this work was done by the author(s) in this article and all liabilities pertaining to claims relating to the content of this article will be borne by the authors.

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ORIGINAL RESEARCH PAPER

Uric acid level and its relationship with the dietary habits of people in greater Kamrup of Assam

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ABSTRACT

Introduction: The evidence for a relationship between dietary patterns and uric acid concentrations is scanty. In the state of Assam, a diverse group of the community lives with different food habit. This study has aimed to evaluate and compare a relationship between Serum Uric Acid level in relation to dietary intake and alcohol consumption among the different community of Kamrup district of Assam.

Materials and methods: The present study was conducted among Ahom, Adivasi, Bodo, Bengali, Karbi, Manipuri and Marwari communities in Greater Kamrup District of Assam. Samples were collected by stratified random sampling technique. Serum uric acid level in relation to dietary intake and alcohol consumption were evaluated and compared.

Results: Uric acid level of Bodo and Ahom community is found higher in comparison to Manipuri, Bengali, Adivasi and Marwari. High Uric acid level is absent among of vegetarian category whereas nonvegetarian who take alcohol have significant high uric acid level. **Conclusion:** Balance dietary habits need to be placed in the context of overall health promotion; disease prevention and disease treatment with appropriate attention to nutritional needs.

Keywords: Gout; diet; alcohol; community; purine.

INTRODUCTION

Since time immemorial, religious devotees abstained from meat or fast for the purpose of achieving the highest degree of physical and spiritual regeneration.¹ Among a moral reformer, Pythagoras who was born a physiologist was the first to claim that, low protein and a strict vegetarian diet was essential for all who wish to live in continence and experience the beneficial effect of the practice in leading

better brain nutrition and in heightening intellectual and spiritual powers.² Some of the greater mathematicians astronomers, philosopher and physicians of antiquity prohibited not only meat but also all foods rich in protein including concentrated vegetable proteins as inimical to reaching the desired states of spiritual continence.³

Gout was originally the disease of the affluent, primarily observed in the middle-aged men of the wealthy upper class.⁴ Although gout was observed through the ages, it became epidemic in the seventeen century to nineteen century when it was a favourite subject of artists.⁵

However, it has been postulated that a major mechanism underlying the development of gout is the excess ingestion of purine-rich foods and alcohol. It was found that the risks of gout were increased by a diet which is higher in meat, seafood, alcohol and lower in low-fat dairy products.⁶ Dietary

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alteration with low purine can help in treating gout and avoiding complications.⁷

Gout food diet that includes complex carbohydrates promotes a feeling and help in maintaining healthy body weight besides providing vitamins, minerals and fiber.⁸ Reducing red meat consumption may be recommended because it has been associated with other health problems such as colon cancer and diabetes.⁹

In the state of Assam, a diverse group of the community lives with different food habit and different background. This original paper has aimed to evaluate and compare a relationship between Serum Uric Acid level in relation to dietary intake and alcohol consumption among the different community of Greater Kamrup District of Assam.

MATERIALS AND METHODS

The present study was conducted among different communities in Greater Kamrup District of Assam. Samples were collected by stratified random sampling technique. Communities selected were like- Ahom, Adivasi, Bodo, Bengali, Karbi, Manipuri and Marwari. Serum uric acid level in relation to diet in different communities was evaluated and compared.

The study was carried out over a period of 2 years with a total number of 280 subjects. 40 subjects from each community consisting of equal numbers of males and females (1:1). They belong from the different community different occupations and socioeconomic status with different food habits and after giving informed consent to participate in the study. Subjects are evenly distributed in the age group of 25 years to 70 years. Dietary history of the subjects is taken very carefully and meticulously by a given special interest in food habits and present diet. Particular care was taken to include all foods that are high in purine. Information is taken in relation to intake of fish, meat (all red meat), alcohol, eggs, vegetables, pulses, dairy products, tea, coffee.

Estimation of serum uric acid was done within 48 hours of collections of the blood samples. Using a calorimeter, the biochemical estimations were done. Uricase converts uric acid to allantoin and hydrogen peroxide. The hydrogen peroxide formed further reacts with a phenolic compound and 4-aminoantipyrine by the catalytic action of peroxidase to form a red-coloured Quinone imine dye complex. The intensity of the colour formed is directly proportional to the amount of uric acid present in the sample.

RESULTS

280 patients of Gout were included in this study, out of which 140 were males and 140 were females. Subjects are evenly distributed in the age group of 25 years to 70 years. Cases are divided into two groups:

- Group 1: In relation to diet.
 Group 2: Serum uric acid level of a different community.
 Group 1: Subdivided into three sub-groups a, b and c.
 Group 1: (a) Person with vegetarian dietary habits.
 Group 1: (b) Persons with nonvegetarian + alcohol dietary habits.
 Group 1: (c) Persons with nonvegetarian - alcohol dietary habits.

Table 1 Communities with types of diet and levels of uric acid

Community	Total respondent	Veg	High uric acid	Non-Veg(- Alcohol)	High uric acid	Non-Veg(+ Alcohol)	High uric acid
Bodo	40	0	0	14	0	26	13
Ahom	40	0	0	17	1	23	6
Karbi	40	0	0	19	0	21	6
Adivasi	40	0	0	28	0	12	5
Bengali	40	0	0	35	0	5	2
Manipuri	40	0	0	19	0	21	7
Marwari	40	40	0	0	0	0	0

Table 1 depicts the absent high uric acid level among vegetarian category whereas nonvegetarian + alcohol groups having significant high uric acid level.

Table 2 Variation of the uric acid level among different groups

Source of variation	SS	df	MS	F
Between groups	40.43	6	6.73	5.64
Within group	325.84	273	1.19	
Total	366.27	279		

All are significant at 5% level

Table 2 depicts the variation in high uric acid level recorded among the Boro community followed by Ahom, Karbi, Adivasi, Bengali, Manipuri significantly. No cases of the high uric acid level were recorded in the Marwari community.

DISCUSSION

Present Study reveals comparative serum uric acid level in relation to diet, people of different communities, viz., Ahom, Adivasi, Bodo, Bengali, Karbi, Manipuri, Marwari. Vegetable which is rich in micronutrient folate and dietary fibre were found to have significant protective role against hyperuricemia.^{4,10}

Intake of fibre shows lower risks of developing hyperuricemia as observed in the present study. Previous research has shown that approximately two-thirds of the

uric acid produced each day is excreted in urine and that one third is eliminated directly in intestinal secretions and saliva.^{11,12}

Some non-vegetarians take vegetarian diet in most of the days in a week; only twice a week they take non-vegetarian diets (Manipuri community and some community take a non-vegetarian diet with alcohol daily according to their social customs and religious ritual. Boro, Ahom, Adivasi, Karbi and Bengali takes mixed veg and non-veg with alcohol. The Marwari community are strict vegetarians and takes vegetarian diet and dairy products daily.¹³

In the non-vegetarian group, they consumed alcohol daily according to social customs and religious rituals. It was observed that serum uric acid level is high in the Boro community. The Boro are mostly non-vegetarian and consume alcohol and pork daily.^{3,8,14}

Alcohol is strongly associated with hyperuricemia because of the ethanol and purine content in alcohol. Uric acid is insoluble in alcohol. As the alcohol content of the blood increases; the blood is not able to dissolve as much uric acid and the excess crystallizes. Alcohol increases purine catabolism in the liver and increases the formation of lactic acid which blocks urate secretion by the renal tubules.¹⁵ Beer is reported to have high guanosine content from yeast and barely fermentation.¹⁶ A possible mechanism for the association of alcohol intake with gout includes the overproduction of lactic acid and fatty acid; which affect the pH values of body and alter the renal excretion of uric acid. Excessive alcohol consumption can have severe negative effects in the ability of the kidneys to maintain the body's fluid, and electrolyte; and acid-base balance.¹⁷

CONCLUSION

Serum uric acid level shows significant variation in relation to dietary habits. It has been seen that intake of non-veg with alcohol, which has high purine content shows significant high serum uric acid level in comparison to non-veg without alcohol and also who are strictly vegetarian. Furthermore, the Boro community have a high uric acid level in comparison to other communities because of their special dietary habits. It was seen that there is no significant rise of the high uric acid level in Marwari who are strictly vegetarian.

Serum uric acid may be a marker for the presence of an adverse cardiovascular disease and it is strongly related to hypertension; hyperlipidemia and diabetes mellitus.

So from the above study, it can be inferred that sound dietary habits need to be placed in the context of overall health promotion; disease prevention and disease treatment with appropriate attention to nutritional needs. It shows that there is a definite rise of serum uric acid level in relation to diet and also a risk factor for the development of gout.

A further study is needed regarding the quantitative and qualitative evaluation of the constituent of nonvegetarian diet in the different community without changing their dietary habit.

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ORIGINAL RESEARCH PAPER

Open thoracotomy and decortication for chronic empyema thoracis: our experience

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ABSTRACT

Introduction: Decortication for chronic empyema thoracis can be performed either by open thoracotomy or by minimally invasive procedure i.e. Video Assisted Thoracoscopic Surgery (VATS). As we don't have facility for VATS, we are treating all chronic empyema thoracis by thoracotomy. The objective of this study is to review all cases of empyema thoracic treated by open thoracotomy and decortication and analyze outcome of treatment. **Materials and method:** Records of the entire patient treated by open thoracotomy and decortication for chronic empyema thoracis over a period of three years from 2015 to 2017 were reviewed retrospectively and analyzed. **Results:** In total, 39 patients had undergone open thoracotomy and decortications for chronic empyema thoracic during this period. 37 of them had excellent recovery and return to normal activities within 4 weeks time. 2 patients had prolonged air leak and recovery period was prolonged for them. **Conclusion:** Chronic empyema thoracic can be treated by open thoracotomy and decortications with low mortality and morbidity.

Keywords: Pleural empyema; chronic pyothorax; posterolateral thoracotomy; pleurectomy.

INTRODUCTION

Empyema thoracis is defined as collection of pus in pleural cavity. According to natural history, the American Thoracic society divided empyema into three phases, (i) exudative or acute phase (ii) fibrinopurulent or transitional phase (iii) organising or chronic phase. In its chronic stage, fibroblasts grow into exudate from both visceral and parietal pleura to form an inelastic pleural peel which entraps the lung to render it virtually functionless.¹ X-ray of Chest and

Computed Tomography scan of thorax are useful tools in diagnosis of empyema.² Various surgical procedures practised to treat this condition include serial thoracentesis, chest tube drainage, intrapleural fibrinolytic therapy and decortication.³ Despite availability of various treatment options, mortality associated with empyema thoracis ranges from 1% to 19%.⁴

Decortication results in the most successful outcome for treatment of chronic empyema thoracis.² The conventional approach for surgical decortication is open thoracotomy.⁵ Decortication is also performed by minimally invasive technique called Video Assisted Thoracoscopic Surgery (VATS). Our institution does not have facility for VATS and we are performing all decortications by open thoracotomy approach only.

This paper has aimed to analyze the experience on decortications via open thoracotomy approach in chronic empyema thoracis and also to know about clinical details of the patients, per-operative findings, post operative course of the patients and outcome of the treatment.

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MATERIALS AND METHODS

Study population: All chronic empyema thoracis patients treated by open thoracotomy and decortication in Cardiothoracic surgery Unit.

Place of study: Assam Medical College & Hospital, Dibrugarh.

Type of study: Descriptive, retrospective and observational study

Study duration: Three years from January 2015 to December 2017

Inclusion criteria: (a) Age above 12 years (b) Failed treatment with antibiotic therapy, pleural aspiration and tube thoracostomy drainage, (c) All patients who fulfilled one or more of the following criteria for diagnosis of empyema i) Drainage of pus on aspiration ii) presence of bacteria in gram stain or culture of aspirate. iii) Biochemical parameters of aspirate indicating empyema (pH <7.2, Lactate Dehydrogenase >1,000 IU/L, glucose level <40 mg/dl). (d) All patients who were symptomatic for more than six weeks before surgery. (d) All patients who had preoperative chest x-ray and computed tomography (CT) scan of thorax performed to confirm the presence of a thickened visceral pleura or a shrunken hemithorax or multiloculated empyema. (e) All patients in whom intrabronchial obstructive pathology was ruled out by bronchoscopy.

Exclusion criteria: Patients with destroyed lung, malignancy, diagnosed bronchopleural fistulas or previous thoracic surgery

Ethical clearance: Ethical clearance obtained from the Institutional Ethics Committee of Assam Medical College & Hospital.

Records of all patients were reviewed to gather information regarding gender, age, symptoms and its duration, signs, side of the hemi thorax involved, aetiology, haemoglobin, leukocyte count, type of pleural aspirate, results of smear examination of the pleural fluid, culture of pleural fluid, biochemical parameters of the pleural fluid, medical and surgical treatment offered before decortication, co-morbidities, duration of operation, length of post operative thoracostomy tube drainage, length of hospital stay, post operative course in hospital, morbidity, mortality, and patients status at follow up in the outpatient clinic. Follow up records were reviewed to know any residual signs and symptoms of empyema, about time required to return to normal physical activities after surgery and findings of check chest X-Rays.

Thoracotomy was performed through posterolateral incision. Purulent materials and debris were completely evacuated. Though complete excision of visceral pleura was attempted in all patients, isolated area of visceral pleura fused inseparably to underlying lung was left behind to avoid

injury to the lung. Parietal pleura was removed partially only. Diaphragm was separated from the lung in all patients. At the end of the procedure, thoracotomy was closed with an apical and a basal thoracostomy tubes in presence of air leak from lung and with only one basal thoracostomy tube in absence of air leak. During post operative period, appropriate antibiotics and adequate analgesia was administered in all patients. Vigorous respiratory physiotherapy was encouraged in each patient. Thoracostomy tubes were removed after cessation of air leak and reduction of drainage to less than 50 ml during the preceding 24 hours. Patients were followed up in the outpatient clinic after discharge.

RESULT

In this study, total 40 patients underwent open thoracotomy and decortication for chronic empyema thoracis. However, malignant mesothelioma was confirmed in one patient after surgery and was excluded. Of the remaining 39 patients 31 (79.49%) were male and 8 (20.51%) were female. Their age ranges from 13 to 70 years (average age being 34.67 years).

Their common presenting symptoms were cough in 31 (79.49%), fever in 27 (69.23%), chest pain in 27 (69.23%), and dyspnea in 21 (53.85%) patients. They were symptomatic for more than six weeks, average duration being 56.69 days (range 45 days to 95 days). Clinical signs of chronic empyema i.e. contraction of hemithorax and narrowed intercostals spaces, were present in all patients. Empyema was on right side in 22 (56.41%) and left side in 17 (43.59%) patients.

The etiology of chronic empyema was pneumonia in 29 (74.36%), trauma in 8 (20.51%), ruptured hydatid cyst in 1 (2.56%) and osteomyelitis of rib in 1 (2.56%) patients. Out of 39 patients with pneumonia, 7 (17.95%) were undergoing treatment for tuberculosis.

The average haemoglobin of these patients was 10.2 gms/dl. 22 (56.4%) patients had leukocytosis which becomes normal after decortication.

Frank pus was aspirated in 10 (25.64%) patients and Gram stain was positive in 9 (23.08%) patients. Bacterial culture of pleural fluid was positive in 13 (33.33%) patients. Lactate dehydrogenase was elevated and was more than 1000 IU/L in all of them.

All patients received antibiotics before decortication. Diagnostic tapping was done in all, thoracostomy tube drainage was performed in 33 (84.62%) and rib resection and open drainage was performed in 3 (7.69%) patients. Co-morbidities noted were diabetes mellitus in three (7.69%), chronic airways obstructive disease in two (5.13%) and hypertension in 5 (12.82) patients.

Chest X ray and Computed Tomography (CT) scan of thorax

demonstrated presence of narrowed intercostal spaces, thickened pleura, and contraction of affected hemithorax (**Figure 1**, **Figure 2** and **Figure 3**). Multiloculated collection was detected in 10 (25.64%) patients.

Per-operative findings noted were narrowed intercostal space, thickened visceral and parietal pleura, shifting of mediastinum to the affected side and elevation of diaphragm in all patients. Empyema cavity contained pus 10 (25.64%) patients and organized debris in rest. Multiloculation was detected in 10 (25.64%) patients. Underlying lung was trapped, collapsed and consolidated in all patients. Pleural calcification was noted in 15 (38.46%) patients.

During thoracotomy resection of one rib in 5 and two ribs in 6 patients were required to overcome severe ribs crowding. Single basal thoracostomy tube was placed in 8 (20.51%) and both apical and basal thoracostomy tubes were placed in remaining 31 (79.49%) patients.

Average time required for decortications was 122 min (range from 70 to 210 min). 37 (94.87%) patients were discharged without any complications. The average days required for removal of their apical thoracostomy tube was 3 days (range from 2 to 9 days) and same for basal drainage was 6 days (4 to 16 days). Average hospital stay for these patients was 11 days. Chest x-ray done before discharge of these patients showed a well-expanded lung and a partially obliterated costophrenic sulcus (**Figure 4**). They were symptom free and returned to regular activities within



Figure 1 PA View of Chest of Chronic Empyema Thoracis

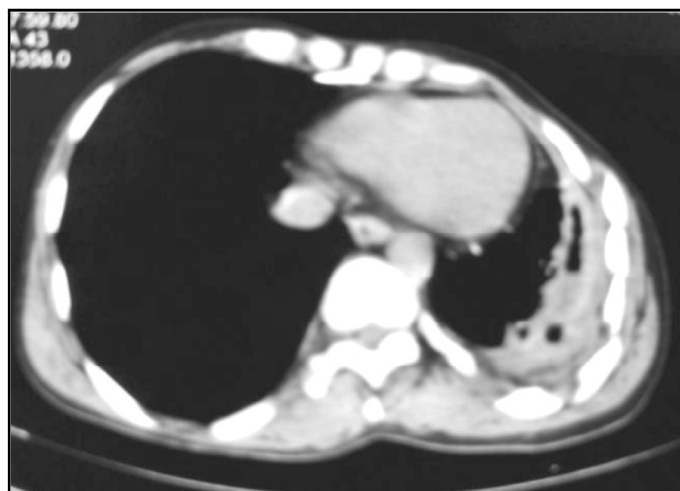


Figure 2 CT Scan of Thorax of Chronic Empyema Thoracis



Figure 3 CT Scan of Thorax of Chronic Empyema Thoracis



Figure 4 Chest X-ray Before Discharge.

4 weeks after decortication. Followed up chest X-ray did not reveal any residual collection or recurrence.

Only Two (5.13%) patients receiving anti-tubercular chemotherapy had prolonged air leak and drainage. However these complications resolved well with adequate treatment. The average days required for removal of their apical and basal tubes were delayed and their average hospital stay was 26 days. On average they required 9 weeks to return to normal physical activities. There was no mortality in this study.

The follow-up period for patients ranged from 3 to 12 months. No patient had recurrence of empyema during follow up period.

DISCUSSION

Chronic phase of empyema thoracis begins after 7 to 10 days of onset of disease and is completed by 4 to 6 six weeks.⁶ All patients included in this series were symptomatic for more than six weeks. Most practitioners prefer to perform decortication for this stage through open thoracotomy approach.⁷

The surgical procedure of decortication consists of removal of fibrous pleura along with pus and debris from empyema cavity. This results in elimination of pleural sepsis and allows re-expansion of underlying collapsed lung.

Empyema thoracis patients usually present with symptoms of fever, chest pain, dyspnea, and cough with or without evidence of systemic toxicity.⁸ The commonest etiology of empyema is pneumonia which may be caused by bacterial, tubercular, viral and mycotic infection.⁶ In a review of empyema that involved 14 studies and total of 1383 patients, 70% of patients were found to have pleural infection secondary to pneumonia.⁹ Other causes enumerated for empyema are trauma, lung abscess, as a complication of thoracic surgery, extension of subphrenic abscess, as a complication of pneumothorax, foreign bodies in the bronchial tree, spontaneous rupture of esophagus and generalized sepsis.⁶ Pneumonia was the predominant etiology in our series, of which 7 were due to tuberculosis. Another cause of empyema in our study was due to extension of infection from osteomyelitis of rib. Sometime undiagnosed malignancy is also be detected after decortications.¹⁰ In our study a malignant mesothelioma was diagnosed after decortication and was excluded from the study.

Analysis of biochemical parameters of pleural fluid is required for confirmation of empyema.¹¹ In this study Frank pus was aspirated in 10 (25.64%), gram's stain was positive in 9 (23.77%) and bacterial culture was positive only in 13 (33.33%) patients. Pre-operative use of antibiotics may be a cause of failure to culture organisms from the empyema fluid and detect microorganism in Gram stains.^{2,12}

Lactic dehydrogenase was elevated in all patients. A study has established that the level of lactic dehydrogenases increases with increase of the duration of empyema.¹³

Chest x-ray and CT scan of thorax performed before decortications give valuable information regarding underlying pathology. These radiological investigations help in detection of loculations, thickened pleura, size of the empyema, evidence of constriction of the thoracic cage underlying lung disease like abscess and tumour.² We routinely performed bronchoscopy in all patients. This helps to rule out presence of any endobronchial lesion which may prevent re-expansion of lung after decortication.¹⁴

In a chronic empyema thoracis, affected hemithorax is contracted, intercostal spaces are narrowed, mediastinum is shifted to the affected side, and diaphragm is elevated.¹⁵ These findings were noted in all our patients on clinical examination, in radiological evaluation and during decortication. In 11 (28.21%) patients, we had to resect one or more ribs during surgery because of presence of severe crowding of ribs.

During decortication, attempts were made to excise complete layer of visceral pleura while parietal pleura were only partially excised. Parietal pleurectomy increases operative time and blood loss during surgery and hence many authors discourage it.¹⁶

Post-operative recovery of 37 (94.87%) patients was uneventful. Average time required for decortications (122 min), average duration of thoracostomy tube drainage (3 days for apical thoracostomy tube and 6 days for basal thoracostomy tube, average duration of hospital stays (11 days), average weeks required to return to normal physical activities (4 weeks) and morbidity for them were almost similar to decortication performed by other authors.^{5,14} Normalization of white blood cell count was observed in all patients after decortications. They became symptoms free after surgery and their follow up chest X-ray demonstrated well expanded lung. There was no recurrence of empyema. The reported success rate of decortication is 87%–100% and mortality rate ranges from 0% to 9%.^{12,17,18} Success rate of our series was 94.87% and mortality rate of our series was 0%.

Cause of this satisfactory outcome may be attributed to proper radiological evaluation before surgery, exclusion of patients with previous thoracic surgery, destroyed lung, or bronchopleural fistula, and regular post-operative vigorous respiratory physiotherapy. Moreover, we did not combine decortication with any pulmonary resection in this study. Similar result was also reported in another prospective study.¹⁴

Video-assisted thoracoscopic surgery (VATS) has been found to be a valuable tool for thoracic surgeons and it has been proposed for treatment of chronic empyema thoracis.¹⁹

However one study found that empyema of more than 3 weeks duration with enhanced thickened pleura and evidence of restriction on CT scan of thorax is inaccessible to VATS approach.²⁰

Another study demonstrated that the probability conversion of VATS to open thoracotomy increased manifold if it was performed between after 30 days of onset of symptoms.²¹ All patients included in our study were symptomatic for more than six weeks, all had pleural thickening and narrowed intercostals space. Even if VATS was available, probability of conversion to open thoracotomy was high in these patients.

CONCLUSION

The commonest cause of chronic empyema thoracis is pneumonia. Decortication is the treatment of choice in chronic stage. Mortality and morbidity associated with the procedure is low and can be recommended for chronic phase of the disease.

Conflict of interest: None declared.

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ORIGINAL RESEARCH PAPER

Custodial deaths: a retrospective study in Mumbai region

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ABSTRACT

Introduction: The word custody implies guardianship and protective care. Even when applied to indicate arrest or incarceration, it does not carry any sinister symptoms of violence during custody. Preventing torture in custody and ensuring strict compliance of its guidelines in custodial deaths is one of the important agendas on the NHRC's list. Sudden and unexpected death in custody is commonly associated with allegations of torture against law enforcement agencies. **Aims:** This study is done to find out the commonest cause of death in custodial death in Mumbai region and its relation to age, sex, manner of death, hospital stay and time interval between death and post-mortem. **Materials and methods:** This study was carried out retrospectively at Sir JJ Hospital in Mumbai region. 95%, males and 5% females who were died in custody were studied retrospectively for one year and data was analysed using SPSS. **Results:** In this study 95% were males and 5% were females. A most common cause of death is Pulmonary Tuberculosis (42%), followed by hanging seen in 11.6% cases. The natural cause was in 79% case and un-natural in 21% cases. **Conclusion:** The majority of deaths in custody are due to natural causes, improper medical facilities could be an important aggravating factor. Providing healthcare facilities, equivalent to that available in the community is one of the most important remedial measures.

Keywords: Human rights; jail; prisoners.

INTRODUCTION

The word custody implies guardianship and protective care. Even when applied to indicate arrest or incarceration, it does not carry any sinister symptoms of violence during

custody. Legally custody is defined as, any point in time when a person's freedom of movement has been denied by law enforcement agencies, such as during transport prior to registering a case, or during the arrest, prosecution, sentencing, and correctional confinement. Death in custody is defined as death occurring in some form of custodial detention, such as police cell or prison. Preventing torture in custody and ensuring strict compliance of its guidelines in custodial deaths is one of the important agendas on the NHRC's list. Sudden and unexpected death in custody is commonly associated with allegations of torture against law enforcement agencies.

No civilized law postulates custodial cruelty - an inhuman trait that springs out of a perverse desire to cause suffering when there is no possibility of any retaliation; a senseless exhibition of superiority and physical power over the one who is overpowered or collective wrath of hypocritical thinking. It is one of the worst crimes in the civilized

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society, governed by the rule of law and poses a serious threat to an orderly civilized society. Torture in custody flouts the basic rights of the citizens and is an affront to human dignity.

Prisoners have human rights and prison torture is the confession of the failure to do justice to living man. For a prisoner, all fundamental rights are an enforceable reality, though restricted by the fact of imprisonment. Simply stated, the death of a person in custody whether of the Police or Judicial will amount to Custodial Death.

The Royal Commission of Australia into aboriginal deaths recommended that the definition of a death in custody for the purpose of post-death investigation and for the national monitoring of custodial deaths.

The motto of the National Human Rights Commission is "Sarve Bhavantu Sukhinah." Happiness and health for all are sought to be achieved through a rights-based regime where respect for human beings and their dignity is cardinal. President's assent to the Protection of Human Rights Act was a major breakthrough in this direction. Section 3 of the Act provides for the setting up of the National Human Rights Commission (NHRC) and Section 21 provides for the setting up of various States Commissions (SHRC).

As per the NHRC guidelines, all custodial deaths are to be reported within 24 hrs and a post-mortem examination is to be conducted by a panel of doctors & videography has been made mandatory. NHRC Report from 2001-02 to 2006-7 showed an increase in custodial deaths all over India.

Aims: This study is done to find out a) the most common cause of death in custodial death in relation to age and sex, manner of deaths b) hospital stays in natural cases of deaths c) time interval between custodial death and starting of inquest panchanama d) most common cause of death in police custody and in Magistrate custody e) most common addition in these custodial deaths.

MATERIALS AND METHODS

This is a retrospective analysis of 43 cases of custodial deaths that have occurred in the last one year during their treatment in Sir JJ Hospital or who had previously received treatment either in the respective jail hospitals or peripheral health centres and brought dead cases. The post-mortem examination of these cases was conducted in the mortuary of the institute as per the guidelines laid out by the National Human Rights Commission. Relevant information was gathered from post-mortem reports and medical record files. Causes of death were categorized under natural (disease process) and unnatural (suicides/accidents/homicides). Factors such as sex, age, place of occurrence, treatment protocols, past medical history, allegations of foul play/negligence, etc were considered while analysing the sequence of the events leading to death in these cases.

RESULTS

Total of 43 cases was studied in this one-year retrospective study. This Study showed male preponderance with 95.3% males and 4.7% females. In police custody total 18.6% deaths were recorded and in magistrate custody, 81.4% of deaths were recorded. In this study out of 43 cases 95.3% male was noted and 4.7% female noted.

In this study out of 43 cases 23.3% cases were between the age group of 20-30; 30.2% cases were between the age group of 30-40; 18.6% cases were between 40-50 age group, 18.6% cases were between 50-60 age group and 9.3% cases were 60-70 age group.

In this study out of 43 cases 18.6% cases were police custody cases and 81.4% cases were magistrate custody cases (**Table 1**).

Table 1 Custody type

	Frequency	Per cent
pc	8	18.6
mc	35	81.4
Total	43	100.0

In this study out of 43 cases, 65.1 cases were hospital stay and remaining 34.9% cases were brought dead to the hospital (**Table 2**).

Table 2 Hospital stay

	Frequency	Per cent
Yes	28	65.1
No	15	34.9
Total	43	100.0

In this study out of 43 cases from time of death till starting of post-mortem gap in hours and day were noted by up to 12 hours 9.3% cases; up to 24 hrs 37.2% cases; up to 36 hours 32.6% cases; up to 48 hours 9.3% cases; up to 60 hours 4.7% cases; up to 84 hours 2.3% cases; up to 9 days 2.3% cases; up to 15 days 2.3% cases (**Table 3**). This delay was due to incomplete papers provided by police, delay in panchanama of magistrate etc. in the majority of cases, a post-mortem was done within 24-36 hrs.

Table 3 The gap in hours & day

	Frequency	Percent
12 hrs	4	9.3
24 hrs	16	37.2
36 hrs	14	32.6
48 hrs	4	9.3
60 hrs	2	4.7
84 hrs	1	2.3
9 days	1	2.3
15 days	1	2.3
Total	43	100.0

In this study out of 43 cases 79.1% cases were noted the natural cause of death and 20.9% were the unnatural cause of death (**Table 4**).

Table 4 Manner of death

		Frequency	Percent
Valid	natural	34	79.1
	unnatural	9	20.9
	Total	43	100.0

In this study out of 43 cases, the most common natural cause of death was tuberculosis in non-addicted person i.e. 41.9% and it is found commonly in 30-40 age group. It is commonly seen in males and in magistrate custody (**Table 5**). In this study out of 43 cases most common unnatural cause of death was hanging in non-addicted person i.e. 11.6% and it is most commonly found in 20-30 age group. It is commonly seen in males and in police custody. (Table 5 cause of death)

Table 5 Cause of death

	Frequency	Percent
TB	18	41.9
Hanging	5	11.6
Cancer Squamous	1	2.3

DISCUSSION

Premature death of persons in custody is always tragic. The legal authorities are bound by the law to provide adequate necessary amenities to ensure the health and safety of persons in their custody, including timely medical assistance, and treating the inmates in a humane manner. Majority of the cases studied died due to natural causes, which is in accordance with the global scenario.¹⁻⁷ In this study we have retrospectively analysed all cases of custodial deaths which came to the Department of Forensic Medicine for post-mortem examination during the period 2017 to 2018. The study showed male preponderance with 41 male cases (95.3%). This finding was consistent with other studies conducted previously.⁸⁻¹³

Among the natural deaths, most of the deaths were due to respiratory system involvement with pulmonary tuberculosis being commonest. This finding was supported by various researchers.^{8,14} However Wobeser et al and Frueshwald et al found that the majority of deaths were due to Cardio-vascular diseases.^{15,16} From the above observation, it was clear that prisoners constitute a high-risk group for the acquisition of tubercular infections. This is attributed to overcrowding, closed living conditions, insufficient ventilation, poor living conditions and poor nutrition.

The present study is in line with that of Bansal et al who found that suicide is the most common unnatural manner of death, however, they found, fall from height as the cause in most of the suicidal cases as compared to hanging in the

present study.¹⁴ Hanging was also found to be a most common method of suicide in custody by Agnihotri et al.¹⁷ All these cases be it natural deaths or unnatural deaths show some sort of carelessness and disrespect for human life on the part of authorities.

It was observed that proper records pertaining to their medical illnesses, medical treatment, history of any addiction, etc were not available. Many cases had a history of opium and alcohol addiction. Some may have contracted illness during confinement while many cases had pre-existing illnesses. In a few of the cases, allegations of negligence were made against jail authorities, including non-deliverance of timely medical assistance.

The Article 21, which is one of the luminary provisions in the Constitution of India, also lays emphasis on the fact that no person shall be deprived of his life and personal liberty except according to the procedure established by law. Even the convicts, under-trials, detainees, and other prisoners in custody cannot be denied this precious right.

Our study was limited by the lack of standard data available in the records, it was found that though inquest proceedings in all custodial deaths were supposed to be conducted under 176 CrPC, the investigating officer was heavily dependent on jail authorities for the relevant information.

CONCLUSION

When the state takes away a person's liberty, it assumes full responsibility for protecting their human rights. The most fundamental of these is the right to life. Each year, however, many people die in custody. Though the majority of these deaths are due to natural causes, improper medical facilities could be an important aggravating factor. Providing healthcare facilities, equivalent to that available in the community is one of the most important remedial measures. The provision of adequate treatment for HIV, communicable diseases, drug and alcohol addiction in detention is essential in order to protect the rights to life. Proper awareness among jail authorities and prisoners in such cases can prevent further spread of infection among the inmates.

Developing good practice standards on training; reviewing recommendations from NHRC, and monitoring progress in their implementation are some of the steps in a positive direction. Systemic measures to improve prison conditions, collecting and sharing information on deaths in custody; and commissioning research and implementation of the recommendations by the Government, should be undertaken. The views of the Commission for better maintenance and running of prisons, better trained and more dedicated staff, including medical staff, and de-crowding of prisons are few of the important suggestions to be followed.

Factors such as timely medical diagnosis and treatment, facilities for quarantine in communicable diseases are few of the important issues relating to the healthcare of the

individuals in custody. Strictly following guidelines & slight modification in the already laid down procedures, as well as compliance among jail authorities, will go a long way reducing the morbidity and mortality among prisoners.

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ORIGINAL RESEARCH PAPER

Concomitant fungal infections in patients of pulmonary tuberculosis attending respiratory medicine OPD

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ABSTRACT

Introduction: Fungal infections are frequently encountered in clinical practice; especially the incidence of concomitant fungal infection has been increasing among immunocompromised patients. Present study was carried out to identify of fungal pathogens from sputum sample of pulmonary tuberculosis patients and to assess and determine the prevalence of different fungal pathogens in pulmonary tuberculosis patient. **Materials and methods:** A total of 100 pulmonary tuberculosis patients were interviewed using pre-tested questionnaires and direct mount and culture of sputum was performed for each. **Results:** Of 100 patients, the commonest were in the age group 31-40 years ($n = 29$, 29%) followed by age group 41-50 years ($n = 22$, 22%). Majority of participants were tea garden workers ($n = 36$, 36%) followed by daily wage workers ($n = 14$, 14%). It was observed that 26% ($n = 26$) were KOH positive and culture positive; 1% ($n = 1$) was KOH negative and culture positive; 30% ($n = 30$) were KOH positive and culture negative; 43% ($n = 43$) were both negative. Highest co infection was with *C. albicans* ($n = 15$, 68.18%) followed by *C. tropicalis* ($n = 4$, 18.18%). Prevalence of mycotic co infection was highest in Multi-drug Resistant TB (MDR-TB) (60%) followed by Category II (35.71%) than Category I (19.40%) DOTS recipients. The prevalence of fungal infection in male smokers was found to be statistically significant ($P < 0.05$). **Conclusion:** Mycotic confection in patients with pulmonary tuberculosis is inevitable. Adequate measures need to be taken for the accurate identification and treatment of these opportunistic infections, which are associated with high rates of morbidity and mortality.

Keywords: *Candida albicans*; immunocompromised patients; multi-drug Resistant TB; opportunistic infections; smoking.

INTRODUCTION

According to WHO, Tuberculosis (TB) is one of the top ten causes of death worldwide. In 2018, an estimated 10 million people fell ill with TB and 1.5 million died from the disease.¹ Six countries account for 60% of the total, with India leading the count. It is a leading killer of HIV-positive people. Ending the TB epidemic by 2030 is among the health targets of the newly adopted Sustainable Development Goals.² Malnutrition, overcrowding, poor air circulation and poor sanitation have increased the risk of TB in the lower socio-economic strata of the society.² When such predisposing factors are superimposed with fungal infections, the prognosis of the disease deteriorates gravely. With the increase in the number of immunocompromised patients, incidence of life-threatening fungal infections has also increased significantly.^{3,4} Pulmonary mycosis

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superimposed on tuberculosis influences treatment and has high mortality. As of 2015, Assam registered maximum number of tuberculosis cases in Northeast India, out of which the tea garden community is the most affected.⁵ The prognosis of the disease is further deteriorated with the superadded fungal infections and widespread appearance of multi-drug resistant TB.⁶⁻⁸ The aim of this study is to record the concomitant fungal infection in patients with pulmonary tuberculosis attending Respiratory Medicine OPD in Jorhat Medical College and Hospital. Most of the times these fungal infections are not diagnosed and often mistaken for recurrence of tuberculosis.⁹ These opportunistic infections if diagnosed early can be treated effectively to improve the prognosis of the disease and successful implementation of the drug treatment. Therefore, present study was carried out to identify, assess and determine the prevalence of different fungal pathogens in pulmonary tuberculosis patients.

MATERIAL AND METHODS

A cross sectional observational study was carried out in the Department of Microbiology and Out Patient Department (OPD) of Pulmonary Medicine, Jorhat Medical College and Hospital, Jorhat from 20th July-20th September 2017. A total of 100 patients were taken considering a nonresponse rate of 10%. All patients were enrolled based on proper inclusion criteria and exclusion criteria after taking informed consent.

Inclusion criteria

1. Patient with age group > 15 years and in case of < 15 years, consent was taken from guardian.
2. Patients who gave informed consent to participate in the study or who were willing to participate.
3. Diagnosed cases of pulmonary tuberculosis and those receiving treatment
4. Patients who are diagnosed with HIV, diabetes or any other immunocompromised state.

Exclusion criteria

1. Participants not willing to give consent.

Project proposal and the consent form along with the peer reviewed questionnaire were approved by the Institutional Ethics Committee (Human) of Jorhat Medical College, Jorhat, Assam (Ref No. SMEJ/JMCH/MEU/841/2011/3106).

Collection of sample

A detailed sociodemographic data was collected along with history of on-going anti-tubercular therapy based on RNTCP guideline 2016¹⁰ with the help of a pre-designed and pretested questionnaire. A written informed consent was obtained after explaining the purpose and the scope of the study. The participants were given sterile containers for collection of sputum. An early morning sputum and one spot sputum sample was collected. After proper instruction

early morning sputum was collected before rinsing mouth or intake of food and water. The spot samples were collected in the Pulmonary Medicine OPD or ward under supervision after rinsing mouth with water. After collection, the samples were immediately transported to the Microbiology department for further laboratory investigation. In case of delay, the samples were refrigerated at 4°C.

Maintaining all biosafety precautions the sample was subjected to treatment with 10% Potassium Hydroxide (KOH) for 24 hours placed in a moistened petri plate and subsequently observed under the microscope for the presence of any fungal element and a part of the sample was cultured onto Sabouraud Dextrose Agar and Mycosel Agar in duplicate (Hi-media India Ltd.) and kept at room temperature.

Pulmonary candidiasis was diagnosed based on the presence of budding yeast cells along with pseudohyphae in direct 10% KOH mount, Germ tube test, growth on Chrom Agar and Cornmeal agar. Moulds on SDA and Mycosel Agar were subjected to lactophenol cotton blue mount and slide culture. Molecular characterization of the moulds were carried out in Department of Medical Microbiology, Postgraduate Institute of Medical Education and Research (PGIMER), Chandigarh, India by sequencing of internal transcribed spacer (ITS) region of rDNA. Yeast were identified by Matrix-assisted Laser desorption/ionization Time of flight (MALDI-TOF) (Bruker Daltonics, Bremen, Germany).

Data Analysis

The collected data was noted in a systematic tabular form. The calculations were done using MS Excel and SPSS version 25.0.

RESULTS

In this study, out of 100 enrolled patients, 62% (n = 62) were female and 38% (n = 38) were male. The age range of 31-40 years were mostly affected (n = 29, 29%) followed by age group 41-50 years (n = 22, 22%). Majority of participants were tea garden workers (36%) followed by 14% daily wage and businessmen each.

Out of 100 samples collected, 26% (n = 26) were KOH positive and culture positive; 1% (n = 1) sample was KOH negative and culture positive; 30% (n = 30) were KOH positive and culture negative; 43% (n = 43) were both negative (Table 1).

Table 1 Results of direct microscopic examination using KOH microscopy and fungal culture

Isolates	Culture +ve	Culture -ve
KOH+ve	26(26%)	30(30%)
KOH-ve	1(1%)	43(43%)

In the study, 22% (n = 22) of the coinfection was with *Candida* spp. followed by 1% (n = 1) *Aspergillus niger*, 1% (n = 1) *A. terreus*, 1% (n = 1) *Mucor* sp. and 1% (n

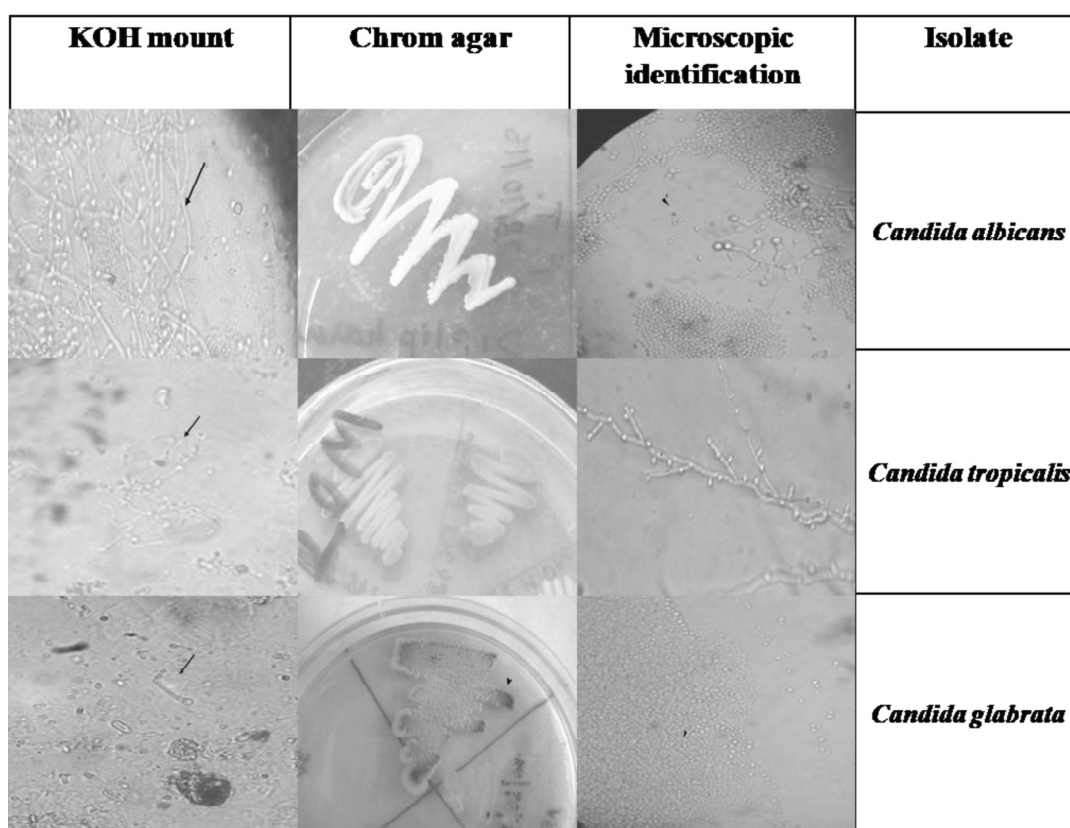
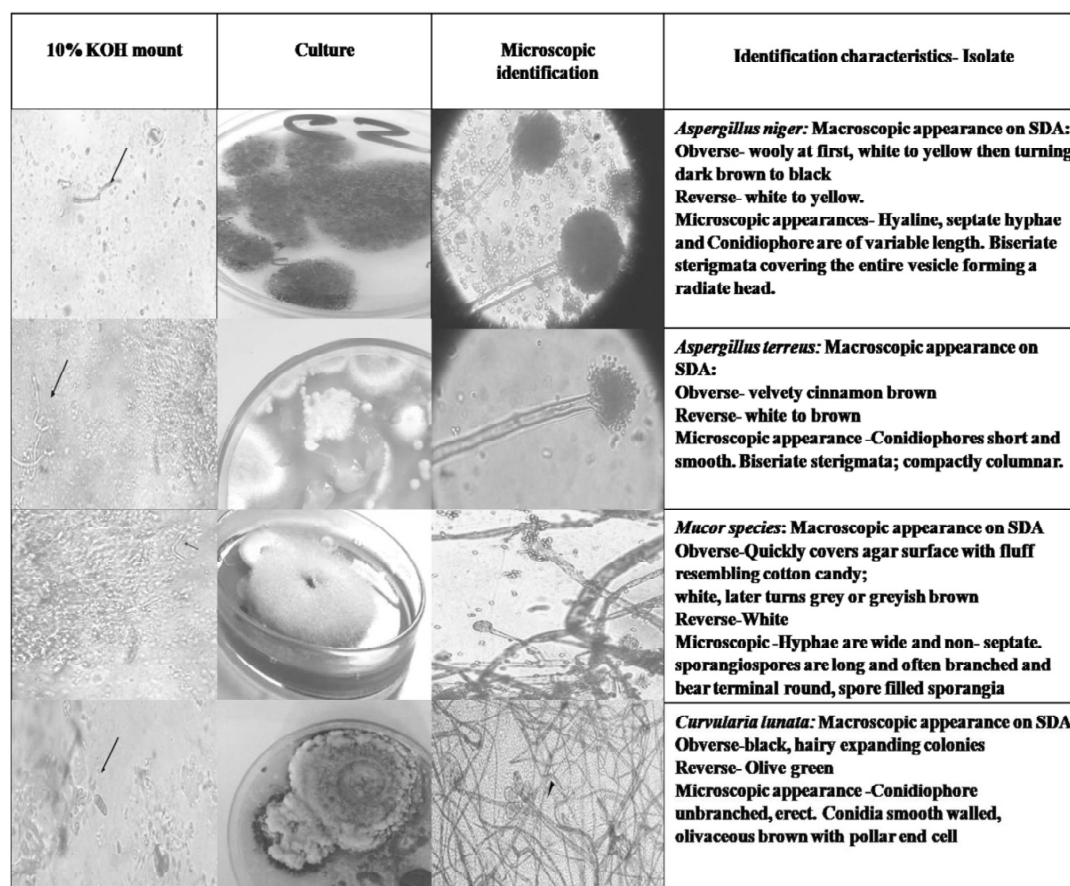
Figure 1 Photographs from direct mount and culture of *Candida* spp.

Figure 2 Direct mount and culture of moulds

= 1) *Curvularia lunata* (Figure 1 and 2). Among *Candida* spp., highest co infection was with *Candida albicans* (68.18%, n = 15) followed by *Candida tropicalis* (18.18%, n = 4) and *Candida glabrata* (13.63%, n = 3).

The prevalence of mycotic coinfection was highest (60%) in MDR-TB followed by Category II (35.71%) and Category I (19.40%) DOTS recipients (Table 2). Out of 26 patients suffering from superadded fungal infection, 13 participants were undergoing DOTS category I treatment, 10 with DOTS category II and 3 of them were taking treatment for MDR TB.

Table 2 Distribution of population suffering from fungal infections based on the category of DOTS (n = 100)

Fungi	DOTS category			Total
	Category I (67)	Category II (28)	MDR TB(5)	
<i>Candida</i> spp.	12	8	2	22
<i>Aspergillus terreus</i>	-	1	-	1
<i>Aspergillus niger</i>	-	-	1	1
<i>Mucor</i> sp.	-	1	-	1
<i>Curvularia lunata</i>	1	-	-	1
Total	13/67 (19.40%)	10/28 (35.71%)	3/5 (60%)	26

The highest co-infection was seen in tea garden workers (46.15%, n = 12) followed by retired workers (15.38%, n = 4) and businessman (15.38%, n = 4) each. Of 26 patients suffering from superadded fungal infection, the male manual workers (57.69%, n = 15) had high preponderance of acquiring superadded fungal infection, the male manual workers (57.69%, n = 15) had high preponderance of acquiring superadded fungal infection. It was also observed that 11.53% (n = 3) male suffering from diabetes along with pulmonary tuberculosis were found to have concomitant fungal infection. The prevalence of fungal co infection was significant ($P < 0.05$) among the male smokers (58%, n = 15).

DISCUSSION

Fungal infection associated with pulmonary tuberculosis is a complicated health condition among TB patients. The present study detected 26% prevalence of concomitant fungal infection with pulmonary tuberculosis. *Candida* spp. (22%) shows highest coinfection, similar observation of 26% co-infection with *Candida* spp. was made by Baradhkar et al.¹¹ According to the study of Kali et al., 2013 prevalence of *Candida* co-infection of lung ranges between 15-32%.¹² *Candida* forms a part of normal microbial flora of healthy individuals. When the host resistance is lowered, these commensals turn into aggressive pathogens causing life threatening systemic infections. The role of *Candida* spp. as secondary invaders in patients having pre-existing diseases like pulmonary tuberculosis is well documented.¹³

Filamentous saprophyte fungal pathogen and their spore have a wide distribution in the air and the transmission of infection occurs always through inhalation.¹³ *Aspergillus* is one of the airborne fungi that do not normally cause disease, but immunocompromised patients are more susceptible of acquiring these infection.¹³ In this study, the predominant *Aspergillus* spp. were *A. terreus* (1%) and *A. niger* (1%). This is in contrast to those obtained by Razmpa et al.¹⁵ where 30% of *A. flavus* was documented. These variations in the incidence and isolation of various fungi can be attributed to geographical variations of the conducted studies¹³. *Mucor* sp. was isolated from 1% of cases in our study. Mucormycosis is an opportunistic infection caused by ubiquitous filamentous fungus. Pulmonary involvement with *Mucor* spp. occurs in severe immunosuppression.¹⁵

Present study showed that the prevalence of concomitant fungal infection is higher in MDR-TB (60%) followed by Category II (35.71%). This is similar to the study by Mathavi et al.¹⁷ where fungal infection was more common in category II patients than category I. In recent studies it has been observed that patients with MDR-TB show low IFN- γ production when compared with patients with non-resistant tuberculosis before and after treatment which can be attributed to the development of mycotic co-infection in these patients.⁸

In our study the highest (46.15%) prevalence of fungal co-infection was in the tea garden workers. According to the study of Chelleng et al.⁵ the preponderance of the tea garden community towards pulmonary tuberculosis was associated to a state of low body mass index, poor living conditions, illiteracy and irregular income. The acquisition of fungal infection could be possibly due to their constant exposure to the fungal ecosystem in the tea garden. The climatic condition of Jorhat and north eastern region which temperature, rain and humidity provides an excellent niche for various fungal infections in the North Eastern region.¹⁸

CONCLUSION

The study brings into light the burden of co fungal infections amongst the patients suffering from pulmonary tuberculosis especially amongst the tea garden workers. The living and working conditions superadded by the lowered immune status impacts the susceptibility of the individual to fungal infection. Hence, adequate measures need to be taken for the early identification and treatment of these opportunistic infections, which are associated with high rates of morbidity and mortality along with improving their living standards.

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ORIGINAL RESEARCH PAPER

Efficacy of oral fenofibrate in management of unconjugated hyperbilirubinemia in the neonate

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ABSTRACT

Introduction: Neonatal jaundice is one of the commonest neonatal problems health care providers encounter every day. Though there are effective treatments like phototherapy and exchange transfusions, there is a need to search for an inexpensive, safe and effective drug therapy for this condition. Objectives were to study the efficacy of oral fenofibrate, a lipid-lowering drug in adults, in the management of unconjugated neonatal hyperbilirubinemia.

Materials and methods: Study design: Prospective, double-blinded. Setting: NICU of Silchar Medical College, from July 2017 to June 2018. 100 newborns with unconjugated hyperbilirubinemia divided into 2 groups-control and intervention, 50 in numbers in each group. Efficacy of oral fenofibrate was determined by comparing the control group (receiving phototherapy alone) to the intervention group (fenofibrate+phototherapy) by measuring serum bilirubin level at 0, 12, 24 and 48 hours and the duration of phototherapy. **Results:** The mean value of total serum bilirubin (TSB) in the fenofibrate group at 24 and 48 hours of starting phototherapy is considerably lower than the control group ($p < 0.005$ and 0.001 respectively). No side effects of fenofibrate observed. **Conclusion:** Fenofibrate appears to be an effective drug in the management of unconjugated neonatal hyperbilirubinemia.

Keywords: Unconjugated; neonatal hyperbilirubinemia; phototherapy.

INTRODUCTION

Bilirubin is a pigment derived from the breakdown of heme-containing proteins in the reticuloendothelial systems as shown in **Figure 1**. The normal adult serum bilirubin level is less than 1 mg/dl. Adults appear to be jaundiced when the serum bilirubin level is greater than 2 mg/dl and in newborns when it is greater than 7 mg/dl.¹

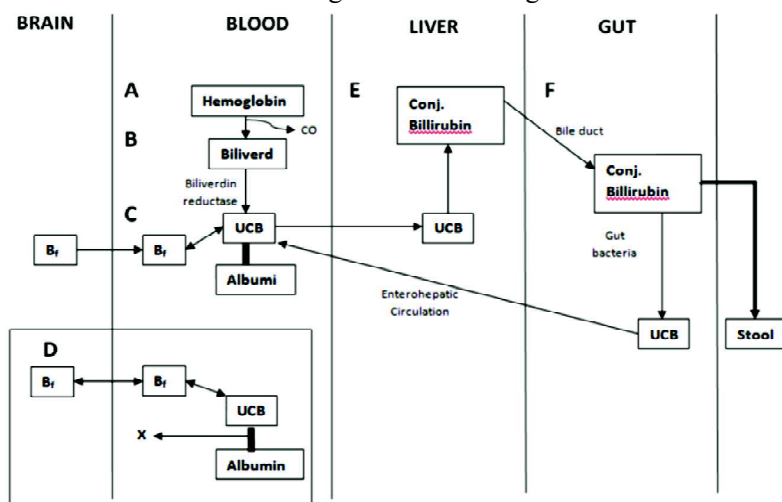


Figure 1 Bilirubin metabolism

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Here (A) Hemoglobin is converted to biliverdin, catalyzed by heme oxygenase and producing carbon monoxide in a concentration equimolar with bilirubin; (B) Nontoxic biliverdin is catalyzed by biliverdin reductase to unconjugated bilirubin (UCB), a natural anti-oxidant at low levels, but neurotoxic at high levels; (C) UCB is nonpolar and virtually insoluble in water at neutral pH and is bound to serum albumin. Thus little UCB exists in the form of unbound or free unconjugated bilirubin; Bf, but it is Bf and not albumin-bound UCB that enters the brain; (D) Interstitial fluid, and cerebrospinal fluid, and is responsible for neurotoxicity. UCB is taken up by liver cells; (E) Conjugated with glucuronide by UDP glucuronosyl transferase (UDPGT) to nontoxic, water-soluble conjugated bilirubin (Conj. Bili), and excreted in bile. Conjugated bilirubin is eliminated in stool; (F) but also broken down in the gut by bacteria to UCB which is reabsorbed back into the bloodstream, the so-called enterohepatic circulation.²

Jaundice in a newborn has been the all-time anxiety of the parents. This is because of the fear of toxicity of elevated bilirubin in the developing brain and immature organ systems. Unconjugated bilirubin (UCB), a natural antioxidant at the low level but is neurotoxic to the developing brain. Toxicity of bilirubin in otherwise healthy full-term infants and premature infants is highly debatable.³⁻⁶

The level of bilirubin that is regarded as safe in infants, particularly those who are preterm and have low birth weight is unknown. Bilirubin levels that are toxic to one infant may not be toxic to another, or even to the same infant in different clinical circumstances. Toxicity like acute bilirubin encephalopathy, chronic bilirubin encephalopathy (classical kernicterus), sensory neural deafness, intellectual deficit, etc., are irreversible if jaundice is not detected and treated early.

Therefore, various nonpharmacological and pharmacological treatment modalities have been tried for the treatment of neonatal jaundice. Though effective, reliable and relatively safe non pharmacological treatment modalities like widely used phototherapy and exchange transfusion have been in use since long, but these have some limitations like long hospital stay, high cost, trained manpower etc. in a resource poor setup. Therefore, search for alternate pharmacological therapy is going on for this condition. Fibrate group of drugs are such alternative pharmacological therapy for neonatal jaundice, being tried by various workers. Fibrate groups of drugs are hypolipidemic drugs. Fibrates act through activation of Peroxisome Proliferator-Activated Receptor (PPAR) α to modulate lipid oxidation and metabolism. Fibrates also enhance bilirubin conjugation and excretion through induction of enzyme glucosyltransferase activity. Unconjugated bilirubin which is insoluble in water at neutral

pH after conjugation becomes non-toxic, water-soluble and excreted in bile.

Most of the studies of the effects of fibrates on hyperbilirubinemia have been done with clofibrate.^{7,8} Fenofibrate, a 2nd generation fibrate has a similar mechanism of action as that of clofibrate but has lesser side effects and higher efficacy. In the adult population, fenofibrate has better safety than clofibrate and widely used as a hypolipidemic drug.⁹ Therefore, fenofibrate has replaced clofibrate as a drug for the treatment of hyperbilirubinemia.¹⁰ No serious side effects have been reported with a single dose administration of fenofibrate in the neonatal period.¹¹ Though there are many studies with clofibrate, there is a paucity of studies on fenofibrate as a treatment modality of neonatal hyperbilirubinemia.

Considering this background, the present study was designed to assess the efficacy of oral fenofibrate and its possibility as adjuvant or alternative therapy in uncomplicated neonatal jaundice.

MATERIALS AND METHODS

This prospective study was conducted at Silchar Medical College and Hospital, Assam; a PG teaching hospital with a level III neonatal care unit. The study period was of one year duration, from July 2017 to June 2018. Prior Institutional Ethics Committee approval of the protocol was obtained and written informed consent was taken from one of the parents before the inclusion of the neonates to the study. Study design: Prospective, double-blinded randomized controlled trial. Randomization was done by closed envelope technique into two groups. The study population was newborn of age day 1 to day 7 admitted in NICU for jaundice. The babies were screened for exclusion criteria and were included after meeting the exclusion criteria. The exclusion criteria were - i. preterm infants (<35 weeks & weight <2 kg), ii. conjugated bilirubin >1.5 mg/dl or 15% of TSB iii. newborns with signs of sepsis, asphyxia, shock, congenital anomaly iv. metabolic disorders v. newborns on phototherapy before enrolment, referral vi. other reasons.

Sample size: The sample size was 100 newborns divided into 2 groups- 50 in each group, A. Phototherapy (control group) B. Fenofibrate with phototherapy (intervention group).

Drug used: Since liquid preparation of fenofibrate was not available, a Tablet form of fenofibrate, was used. 145 mg tablet of fenofibrate was dissolved in 14.5 ml of distilled water so that 1 ml of this solution is equivalent to 10 mg of fenofibrate. The single oral dose of this solution was administered to the intervention group (group B) in the dose of 10 mg/kg and an equal amount of EBM was administered to the control group (phototherapy group, A).

Both the groups were placed under phototherapy at a distance

of 20 cm from the phototherapy lamps continuously with an interruption during breastfeeding only. Before starting the interventions, both the groups were evaluated for CBC, ABO & Rh group of both baby and mother, total bilirubin, reticulocyte count, PBS study, Coomb's test, G6PD. Total serum bilirubin measured every 12 hourly till TSB fell 2mg/dl below the age-specific threshold according to AAP nomogram and phototherapy was stopped whenever that level was achieved. Before the discharge/stoppage of therapy serum urea, creatinine, LFT was done in the intervention group where drug toxicity suspected.

Baseline demographic variables such as gender, gestational age, birth weight, type of delivery were recorded. Data analysis: Comparative statistical analysis was carried out between the control and intervention groups. p values were calculated using the student's t-test, chi-square test. p values <0.05 is considered as statistically significant. Statistical software used was SPSS, Graph Pad Quick Calcs and Microsoft Excel 2010.

RESULTS

Table 1 Baseline demographic variables n (%)

	Control group (A)	Intervention group (B)	p value	
Age in hrs (mean)	65.28	63.12	0.74	Insignificant
Sex -				
Male	21(44)	28(56)	0.07	''
Female	28(56)	23(46)		
Birth wt (mean) in kg	2.6	2.7	0.714	''

Table 2 Duration of phototherapy (in hours)

	Control Group (A)	Intervention Group (B)	T score	p value	
Mean duration	21.12 ±12.9	16.56 ±5.8	2.27	0.024	Significant

Table 3 Comparison of specific duration of phototherapy n (%)

Duration of photo-therapy (in hours)	Control group (A)	Intervention group (B)	P value
<12	24(48)	31(62)	
13-24	20(40)	19(38)	0.031, Significant
>24 (24-7days)	6(12)	0(0)	

Table 4 Mean TSB levels during treatment among control and intervention group (Bilirubin level in mg/dl)

Time in hrs	Control group (A)	Intervention group (B)	p value
On admission	16.6	16.8	0.33, Insignificant
12	17.6	17.4	0.48
24	16.2	15.1	<0.005, Significant
48	14.8	13.3	<0.001

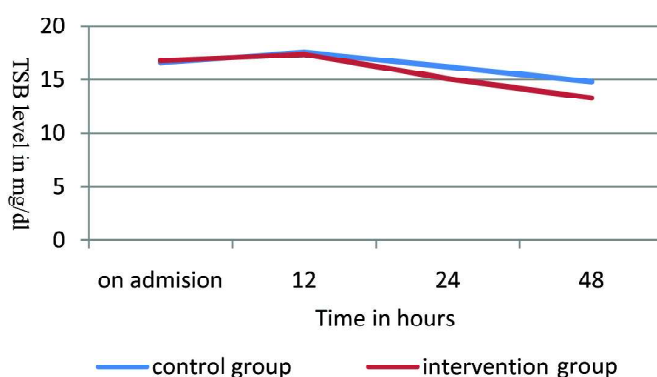


Figure 2 Line graph showing TSB levels during treatment among control and intervention group

DISCUSSION

Neonatal jaundice is a common problem faced by child health care providers and it is important for prompt treatment because of its effects on growth and development. Phototherapy and exchange blood transfusion have been in use as the main interventional therapy for neonatal jaundice. But as for drug therapy for this condition, very few drugs have been tried. Phenobarbitone is one of the drugs in use since long for the treatment of unconjugated hyperbilirubinemia. Another group of drugs, fibrates, though lipid-lowering drugs, also have similar actions like phenobarbitone like induction of the enzyme glucosyltransferase. Out of the fibrates, fenofibrate is easily available, inexpensive and relatively has a better safety profile.

The result of this study shows that the administration of fenofibrate with phototherapy i. reduces the duration of phototherapy and hospital stay (**Table 2** and **Table 3**) ii. rapid reduction of bilirubin level (**Table 4**). Similar results were also found by El-Frargy et al.¹² in their study in Egyptian neonates but they tried with 2 drugs-phenobarbitone and fenofibrate in 2 separate groups. Significant reduction of TSB and duration of phototherapy were also reported by Ahmadpour KM et al from Iran¹³ and Bijay Kumar et al.¹⁴ from India. In another study by Gowda et al.¹⁵ in 100 neonates using a single oral dose of 5 mg/kg of fenofibrate did not find any significant reduction in

bilirubin levels at 12, 24 and 48 hours. This may be because of the low dose of fenofibrate.

No serious side effects of the drug were noted during the study period and follow up to 7 days except in one neonate in the fenofibrate group who developed diarrhea after 24 hours of phototherapy.

CONCLUSION

The present study shows that Fenofibrate is efficacious in the reduction of serum bilirubin as well as the duration of phototherapy in unconjugated neonatal hyperbilirubinemia. But this study is limited with the small number of sample sizes and short follow up. A large multicentric study with longer follows up is needed before recommending fenofibrate as a treatment modality of neonatal unconjugated hyperbilirubinemia or as an adjuvant to phototherapy.

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ORIGINAL RESEARCH PAPER

Psychiatric disorders among patients presenting with attempted suicide in RIMS hospital, Manipur

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ABSTRACT

Introduction: Suicide is fatal act that represents the person's wish to die. A suicide attempt is a self-initiated sequence of behaviors by an individual who, at the time of initiation, expected that the set of actions would lead to his or her own death. During the past decade, there have been dramatic and disturbing increases in reports of suicide among youths.

Materials and methods: A cross-sectional study over a period of one year time was undertaken. All consecutive patients of both sexes aged 18-65 years who have attempted suicide attending Department of Psychiatry, RIMS, Imphal were taken. **Results:** A total of 45 patients were taken up. Among them 26 (57.8%) were male and 19 (42.2%) were female. Majority of them were below 30 years of age (55.6%). 80% of the patients were diagnosed to have a psychiatric disorder, mostly Depression (44.4%) followed by Schizophrenia (15.6%). **Conclusion:** Considerable number of attempters suffered from psychiatric disorder. Early diagnosis of the psychiatric disorders and supportive measures for various stressors would help in prevention of suicidal attempts.

Keywords: Mode of suicide; psychiatric morbidity, depression.

INTRODUCTION

The story of suicide is probably as old as that of man himself. Through the ages, suicide has variously been glorified, romanticized, bemoaned, and even condemned. The word 'suicide' was first used by the English author, Sir Thomas Browne in 1642 in his treatise 'Religio Medici'. The word originated from 'Sui' (of oneself) and 'Caedes' (murder).¹

It is fatal act that represents the person's wish to die. There

is a range, however, between thinking about suicide and acting it out. Some persons have ideas of suicide that they will never act on; some plan for days, weeks, or even years before acting; and others take their lives seemingly on impulse, without premeditation.² A suicide attempt is a self-initiated sequence of behaviors by an individual who, at the time of initiation, expected that the set of actions would lead to his or her own death.³

The risk of suicide is the most common life-threatening situation that mental health professionals encounter. Its assessment is based on both an understanding of its epidemiology, which alerts the clinician to potential danger, and the individualized assessment of the patient. During the past decade, there have been dramatic and disturbing increases in reports of suicide among youths. Understanding the risk factors can help dispel the myth that suicide is a random act or result from stress alone. Many suicidal individuals want to live, but they are unable to see the alternatives, an issue that should always be taken seriously when assessing the risk of suicide.⁴

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Suicide is a complex, multidimensional phenomenon that has been studied from philosophical, sociological and clinical perspective; a student kills himself to escape the ignominy of exam failure; a woman burns herself to escape daily harassment by in-laws over inadequate dowry; finance dealer ends his life to fend off the horde of creditors.⁵ Suicide has grown as a silent epidemic, resulting in psychological distress & financial burden among the relatives of the victims at the family level, as well as great economic problems for the whole society in a statistical sense.⁶

Every year close to 8,00,000 people take their own life and there are many more people who attempt suicide. Every suicide is a tragedy that affects families, communities and entire countries and has long-lasting effects on the people left behind. For every suicide, there are many more people who attempt suicide every year. A prior suicide attempt is the single most important risk factor for suicide in the general population. Suicide is the second leading cause of death among 15-29 year-olds. Out of 8,00,000 people committing suicide worldwide every year, of these 1,35,000 (17%) are residents of India.⁷

The rates of suicide have greatly increased among youth, and youth are now the group at highest risk in one third of the developed and developing countries. The emerging phenomenon of 'cyber suicide' in the internet era is a further cause for concern; also because the use of new methods of suicide are associated with epidemic increases in overall suicide rates.¹

It is very clear that suicide is one of the greatest challenges that our generation is facing. The youth are most vulnerable to suicidal ideations and attempted suicide. So, it is the need of the hour to understand and study the impact of various types of psychiatric illness among the attempted suicide patients. This will help us in proper evaluation and management of psychiatric disorders and prevent the act of suicide and hence the study has been undertaken.

This paper has aimed to determine the socio-demographic profile and psychiatric disorders in patients presenting with attempted suicide in department of psychiatry, RIMS

MATERIALS AND METHODS:

- **Study design:** Cross-sectional study
- **Set up:** Department of Psychiatry, RIMS, Imphal
- **Duration of Study:** August 2017 to July 2018
- **Study population:** Within a period of one year time, all consecutive patients of both sexes aged 18-65 years who have attempted suicide attending Department of Psychiatry, RIMS were taken up for the study
- **Study tools:** Semi-structured questionnaires for recording the socio-demographic information and Mini

International Neuropsychiatric Interview Plus (M.I.N.I. Plus 5.0.0) for assessment of psychiatric co-morbidities.⁸

The patients and caregivers were interviewed using semi-structured questionnaires to record the socio-demographic data and clinical history followed by a detailed mental status examination. Privacy during interview and client confidentiality was maintained.

RESULTS

A total of 45 patients presenting with attempted suicide were taken up in this study. Among them 26 (57.8%) were male and 19 (42.2%) were female. 22 were married, 21 unmarried and 2 were widow/widower.

Out of the study population maximum patients (35.6%) were in the age group of 21-30 years followed by 31-40 years group (26.7%). However a total of 55.6% were within the age of 30 years as shown in **Table 1**. A total of 62.2% of patients were educated till matriculate or below. 22.2% were higher secondary pass and only 15.5% were graduate and above **Table 2**. Among the suicide attempters maximum (31.1%) were unemployed, followed by students (24.4%) as shown in **Table 3**.

Table 4 shows that 80% of the patients were diagnosed to have a psychiatric disorder, mostly Depression (44.4%) followed by Schizophrenia (15.6%) and Alcohol dependence (8.9%). 20% did not fulfill any diagnostic criteria. Maximum (55.6%) patients tried to commit suicide by means of Poisoning, followed by Hanging (24.4%) as shown in **Table 5**. Maximum (75.6%) patients were first time attempters, while 13.3% of them had one prior history of suicidal attempt as shown in **Table 6**.

Table 1 Age Distribution

Age in years	No. of patients	%
18-20	9	20.0
21-30	16	35.6
31-40	12	26.7
41-50	5	11.1
51-60	3	6.7
Total	45	100.0

Table 2 Educational Status

Education	No. of patients	%
Illiterate	2	4.4
Middle education	8	17.8
Matriculate	18	40.0
Higher secondary	10	22.2
Graduate	5	11.1
Post graduate	2	4.4
Total	45	100.0

Table 3 Employment Status

Employment status	No. of patients	%
Unemployed	14	31.1
Govt. job	4	8.9
Self employed	10	22.2
Student	11	24.4
Housewife	6	13.3
Total	45	100.0

Table 4 Diagnosis

Diagnosis	No. of patients (n = 45)	%
No Diagnosis	9	20.0
Diagnosis	36	80.0
● Depression	20	44.4
● Schizophrenia	7	15.6
● Alcohol Dependence	4	8.9
● Opioid Dependence	2	4.4
● Cannabis dependence	1	2.2
● BPAD	1	2.2
● Anxiety disorder	1	2.2

Table 5 Mode of suicide attempt

Mode of Suicide	No. of patients	%
Hanging	11	24.4
Poisoning	25	55.6
Cut throat	3	6.7
Self-immolation	1	2.2
Stabbing	3	6.7
Others	2	4.4
Total	45	100.0

Table 6 Number of previous suicide attempt

No of previous Attempts	No. of patients	%
0	34	75.6
1	6	13.3
2	2	4.4
3	2	4.4
4	1	2.2
Total	45	100.0

DISCUSSION

45 patients who attempted suicide were taken up over the study period. Majority of them were below 30 years of age (55.6%). Similar observations were made in most of the Indian studies. In a study conducted by Kodali M¹¹ it was found that majority (67%) of the suicide attempters were <30 years of age. This is also supported by another study by Nabi J¹⁰ where it was seen that majority of the suicide

attempters (58%) were of young age group (18-25 years).

Male predominance was observed (57.8%), which is consistent with the studies by Rao KN¹³ (52%) and also by Kodali M¹¹ (67%). However a study by Nabi J¹⁰ showed female predominance (62%).

Being separated or divorced was noted to be significantly associated with increased suicidal risk among western literatures (Hawton K)¹², however our study showed no such findings. Many Indian studies states that majority of the suicide attempters were married. Study by Nabi J¹⁰ found that 59% suicide attempters were married. Similar findings were noted by Kodali M¹¹ where 57% were married. 62.2% were educated till matriculation or below. Study by Rao NK¹³ states that 42.0% of the suicide attempters were class X pass or below.

31.1% people were unemployed. A study by Lin C¹⁴ shows an unemployment rate of 51.0%. Another Indian study by Karthik kumar R⁶ shows that 46% of suicide attempters were unemployed.

80% of the patients were diagnosed to have a psychiatric disorder, mostly Depression (44.4%) followed by Schizophrenia (15.6%). 20% suicide attempters did not fulfill any diagnostic criteria and were mostly impulsive acts. Kodali M¹¹ found in his study that 59% of suicide attempters suffered from a psychiatric disorder and major depressive episode (28%) was found to be most common diagnosed disorders. Study by Pandey AK⁹ states that psychiatric morbidity was present in 60% of the cases and major depressive disorder was most common among them. The prevalence of psychiatric morbidity was as high as 89% in a study conducted by Rao KN.¹³ Among them Mood disorders (47%) were maximum and psychotic disorders were diagnosed in 11% of cases.

Mode of attempt was Poisoning (55.6%) followed by Hanging (24.4%). This finding is supported by various other Indian studies. Karthik kumar R⁶ conducted a study that showed that mode of suicide was poisoning in 83% of cases and hanging in 14%. Study by Rao KN¹³ found that Majority (71%) of the suicide attempters had resorted to consumption of chemical compounds. Insecticides were consumed by 52% in a study by Kodali M.¹¹

No 75.6% patients were first time attempters. Kodali M¹¹ found in his study that 76% of the suicide attempters did not have prior suicidal attempts. History of previous suicidal attempt in the past was present in only 18% of the cases as seen in a study by Nabi J.¹⁰

CONCLUSION

The study has several limitations. The Sample size is small and data on follow-up and treatment retention were not included. Even with the above limitations, this study served the purpose of treating the psychiatric morbidity in the

study population. Thus, it can be concluded that considerable number of attempters suffered from psychiatric disorder. Early diagnosis of the psychiatric disorders and supportive measures for various stressors would help in prevention of suicidal attempts. Lack of restriction for procurement of poisons and easy availability may be the reason for the preference to use these agents for attempting suicide.

The results conclude that the variables enhancing the risk of suicide among the vulnerable groups if identified, it would effectively help in early detection and prevention of suicide attempts.

Thus, many Lives could be saved in time.

Conflict of interest: None.

Ethical approval: Taken.

Contribution of authors: We declare that this work was done by the authors named in this article and all liabilities pertaining to claims relating to the content of this article will be borne by the authors.

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ORIGINAL RESEARCH PAPER

Victimologic study of female suicide in Mumbai Region

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ABSTRACT

Introduction: Rising graph of suicides specially among females in India is a matter of deep concern. **Materials and methods:** Two-year, prospective study conducted at a tertiary care centre in Mumbai. **Results:** Suicidal deaths (37.93%) belongs to the age group of 21 to 30 years. 68.97% females committing suicides are housewives, 44.8% females are illiterate while 43.1% are of lower socio-economic class. 82.76% female victims are married and 41.67 % died within 1 year of her marriage. In 34 female victims (58.62 %), no previous attempt of suicide is seen, in 65.52% female victims, suicide note is not found and in 47 cases, females are menstruating (81.03%). Maximum females died due to asphyxia (46.55 %) followed by Burns injury. **Conclusion:** Financial dependency, illiteracy, familial disharmony and emotional turbulence during menstruation are the factors provoking young females to succumb to suicide. Promotion of education, economical independency and counselling are need of the hour.

Keywords: Menstruation; asphyxia; suicide note.

INTRODUCTION

Suicide is an evil enrooting in our society since ages. Government of India classifies a death as suicide if it meets the following three criteria- a) It is an unnatural death. b) The intent to die originated within the person. c) There is a reason for the person to end his or her life.

The reason may have been specified in a suicide note or unspecified.¹ In 2012, 34% each of all suicides with about 46,000 suicides occurred each in 15-29 and 30-44 age groups.² In 2016 the number of suicides in India had increased to 230,314.³ A study conducted in Bangalore showed that domestic violence is a major contributory factor of female

suicides.⁴ There is an increasing trend of suicides with each passing year.

This study is conducted with the aim of probing into the socio-demographic, medico-legal aspects and provocative factors of suicides among females.

MATERIAL AND METHODS

This is a study of observational, prospective study design with a study period of 2 years, i.e. from 1st October, 2016 to 30th September, 2018 conducted at the Department of Forensic Medicine and Toxicology, in a tertiary care centre in a metropolitan city. This study has been approved by the ethics committee (EC). Reference population included cases reported and referred to this study centre, while study population included deaths due to suicide among females. Total of 58 suicides were analysed. Various relevant socio-demographic and medico-legal aspects are stratified and analysed with the resource being post-mortem examination reports, documents of investigating agencies like police inquest Panchnama, Magistrate inquest Panchnama wherever

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applicable, accidental death report and statements of relatives taken by police during investigation, Spot Panchnama, suicide notes if applicable. All findings are explained and portrayed in tabular form and inference is extracted. After entry, data is analysed using frequency distribution and statistical test with the help of computer generated software (S.P.S.S.16.0).

RESULTS

Table 1 Distribution of age group among suicidal deaths

AGE GROUP	FREQUENCY	PERCENTAGE
11 to 20	10	17.24%
21 to 30	22	37.93%
31 to 40	19	32.76%
41 to 50	7	12.07%
TOTAL	58	100

This study shows that 37.93% of suicidal deaths occurred in the age group of 21 to 30 years followed by 31 to 40 years of age group and 11 to 20 years of age group. Minimum (12.07%) belonged to the age group of 41 to 50 years as shown in **Table 1**.

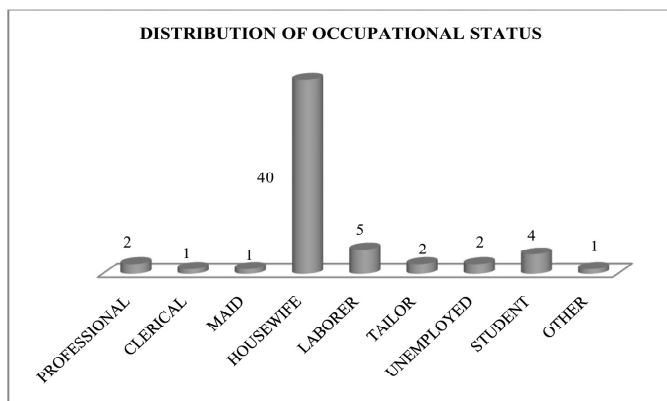


Figure 1 Distribution of occupational status among suicidal female deaths

Out of 58 suicidal deaths, 68.97% females are housewives, 8.62% work as labour, 6.89% females are students, 3.44% females are professionals, tailors and are unemployed. In 1.72% cases, females work as clerks, maids and in other professions as described in **Figure 1**.

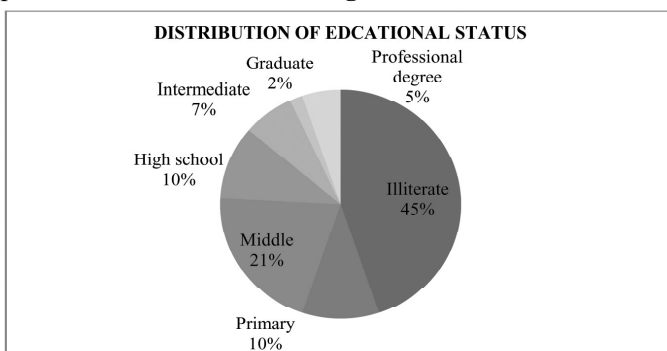


Figure 2 Educational status among suicidal deaths

Figure 3 describes that 45% females are found to be illiterate, 10% receives high school education and primary education, while 21% females learnt up to middle school. 5% females acquired professional degree and only 2% are graduates.

Table 2 Socio-economic status according to Kuppaswamy's among suicidal deaths

Socio-economic status	Frequency	Percentage
Upper	1	1.7
Middle	13	22.4
Upper lower	25	43.1
Lower	19	32.8
Total	58	100.0

Out of 58 female suicides, 43.1% belonged to upper lower class of Kuppaswamy's classification of socio-economic status, around 32.8 % belonged to lower class, 22.4 % are of middle class and 1.7 % belonged to upper class as mentioned in **Table 2**.

Table 3 Distribution of provocative factors among suicidal deaths

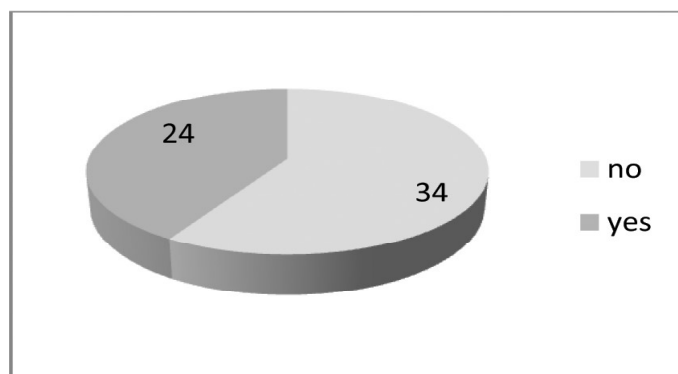
Provocative factors	Frequency	Percentage
Love failure	5	8.62
Domestic abuse	16	27.58
Divorce	2	3.45
Dowry	23	39.66
Psychiatric disease	1	1.72
Exam failure	3	5.17
Infertility	4	6.9
Mental stress due to unknown reason	3	5.17
Not known	1	1.73
Total	58	100

Table 3 shows that in most of the suicidal deaths dowry was a provocative factor (39.66%), followed by domestic abuse (27.58%), love failure in 8.62% cases, infertility in 6.9%, in 5.17% cases mental stress due to unknown reason and exam failure is an important provocative factor. In one case, diagnosed psychiatric disease is the provocative factor, while the provocative factor is not known in 1 case.

Table 4 Duration of marriage among married female victims

Duration of marriage (years)	Frequency	Percentage
<1	20	41.67
1 TO 2	12	25.00
2 TO 3	4	8.33
3 TO 4	5	10.42
4 TO 5	4	8.33
5 TO 6	2	4.17
6 TO 7	1	2.08
TOTAL	48	100.00

In about 41.67% cases, suicide is committed within one year of marriage, in 25% cases, suicide is committed between 1 to 2 years, in 10.42% cases, suicide is committed between 3 to 4 years, in 8.33% cases, suicide is committed between 2 to 3 years and 4 to 5 years, while in 4.17 % cases, suicide is committed between 5 to 6 years and only in one case it is committed within 6 to 7 years of marriage as described in **Table 4**.

**Figure 3** Previous attempts of suicide

In 58.62% cases, no previous attempts of suicide is noted, whereas in 41.37% cases, previous attempts are noted as depicted in **Figure 3**.

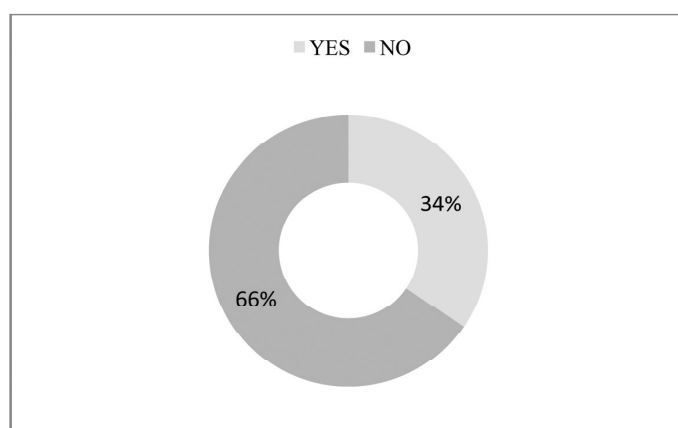
**Figure 4** Suicide notes among suicidal deaths

Figure 4 shows that in 66% cases, suicide notes are not found, while in 34% suicide notes are found.

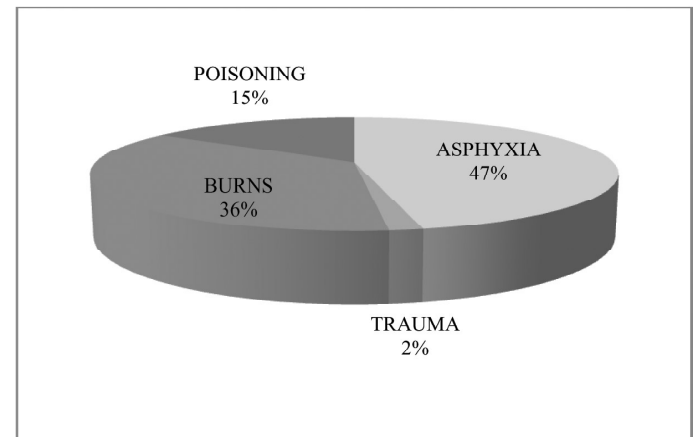
**Figure 5** Cause of death among suicidal deaths

Figure 5 depicts that in 47% cases, suicides are committed by hanging (asphyxia) followed by burns injury (36%), poisoning in 15% deaths and trauma (fall from height) in 2% cases.

Table 5 Menstruating and non-menstruating cases among suicidal deaths

Uterus	Suicidal deaths
Menstruating	47 (81.03%)
Non-menstruating	11 (18.97%)
Total	58

As stated in **Table 5**, 81.03% females are found to be in the menstruation phase of menstrual cycle and 18.97% females are found to be non-menstruating.

DISCUSSION

As described in **Table 1**, maximum female victims among suicidal deaths (37.93%) belongs to the age group of 21 to 30 years and minimum belong to the age group of 41 to 50 years.

These findings are similar to Singh Harnam et al, Pradip Kumar et al, Chavan KD et al, Behera et al, Sharma BR et al, Ambade VN et al.⁵⁻¹⁰ In this younger and vulnerable age group, suicidal tendencies are more frequent, may be due to frustration and depression secondary to exam failure, unsuccessful love affair, marital disharmony, unemployment etc.

As per **Figure 1**, out of 58 suicidal deaths, 2 (3.45 %) are professionals, 1 (1.72%) female victim of clerical job and 1 (1.72%) is maid, 40 (68.97%)female victims are housewives, 5 (8.62%) female victims are laborers, 2 (3.45%) and 2 (3.45%) are tailors, 4 (6.9 %) are students and 1 (1.72 %) are involved in other occupation. Maximum females, who committed suicide are housewives (68.97 %) and minimum (1.72 %) are involved in clerical job, maid and in other occupation. Similar findings are noted in PN Suresh Kumar

et al, wherein housewives are most commonly involved in suicide.¹¹ This may be due to the fact that, housewives are economically and emotionally dependant on their husbands, which makes them more vulnerable to suicide.

As described in **Figure 2**, out of 58 females, 26 (44.8%) are illiterate. Out of 58 females, 6 (10.3%) received primary school education. Out of 58 females, 12 (20.7%) received middle school education. Out of 58 females, 6 (10.3%) received high school education. Out of 58 females, 4 (6.9%) received intermediate education. Out of 58 females, 1 (1.7%) received graduate education.

In the present study, educational status is analysed from the inquest papers, statement of relatives and interview of friends and relatives. Maximum female victims who committed suicide are (44.8 %) are illiterate and minimum female victims (1.7 %) is graduate. It has also been observed that, illiterate females are victims of dowry than other provocative factors, which showed a significant $p < 0.00001$, significance at $p < 0.05$. This highlights the importance of education which will enable these females to become financially independent and protect themselves from dowry harassment and domestic abuse. Similar findings are noted in Vijayamahantesh SN et al and Kadu Sandeep et al.^{12,13}

In this study, the population is categorised according to Kuppuswamy's socio-economic status.

As mentioned in **Table 2**, out of 58 females, (1.7%) belongs to upper socio-economic class. Out of 58 females, 13 (22.4%) belongs to socio-economic middle class. Out of 58 females, 25 (43.1%) belongs to socio-economic upper lower class. Out of 58 females, 19 (32.8%) belongs to socio-economic lower class. Maximum female victims who committed suicide are from upper lower class (43.1 %) and lower class (32.8%). These findings are similar to Vijayamahantesh SN et al and Kadu Sandeep et al.^{12,13} This may be due to the fact that lower and upper lower class female victims are exposed to continuous financial and daily stress of life.

As per table no 3, that in most of the suicidal deaths dowry was a provocative factor (39.66%), followed by domestic abuse (27.58%), love failure in 8.62% cases, infertility in 6.9% and in 5.17% cases mental stress due to unknown reason and exam failure is an important provocative factor. In one case, diagnosed psychiatric disease is the provocative factor, while the provocative factor is not known in 1 case. It has also been observed in the present study that dowry is a significant provoking factor in suicides within first year of marriage with a significant p -value < 0.00001 , when compared.

Similar observations are noted in Santosh CS et al, who stated that dowry was a provoking factor in most cases of suicides in females (27.27%).¹⁴ Anjanamma et al found that domestic abuse was a more significant cause in 44% cases of suicide in females.¹⁵ Similar observations were also noted by Harnam

Singh et al.¹⁶

According to table no 4, out of 48 females, 20 (41.67%) died within 1yr of marriage. Out of 48 females, 12 (25.00%) died between 1 to 2 yrs of marriage. Out of 48 females, 4 (8.33%) died between 2 to 3 yrs of marriage. Out of 48 females, 5 (10.42%) died between 3 to 4 yrs of marriage. Out of 48 females, 4 (8.33%) died between 4 to 5 yrs of marriage. Out of 48 females, 2 (4.17%) died between 5 to 6 yrs of marriage. Out of 48 females, 1 (2.08%) died between 6 to 7 yrs of marriage.

Maximum female victims died within 1 year of her marriage (41.67 %) and minimum died between 6 to 7 years of age (2.08 %). This may be due to inability of married females to adjust with the environment of in-laws in the early marriage years and hence, susceptible to marital disharmony and familial disharmony. These findings are similar to Vijayamahantesh SN et al, Behera et al, Kadu Sandeep et al.^{12,17,13}. These findings are dissimilar to PanaratSritus et al.¹⁸

Figure 3 states that, out of 58 suicidal deaths, in 24 female victims (41.38%) victims previous attempts of suicide are noted. In 34 female victims (58.62 %), No previous attempt of suicide is seen.

This is noted by multiple hesitation marks, previous scars and detailed history by relatives. In maximum female victims, 41.38 % committed previous attempts of suicide, which increases the tendency of committing suicide and dying. Similar findings are noted in Bagadiya et al.¹⁹

Figure 4 states that out of 58 suicidal female deaths, 20 female victims (34.45%) left a suicide note and in 65.52% female victims, suicide note is not found. Suicide notes are written in their own language. Similar findings are noted Benett and Collins et al, wherein suicide notes are found in 22 % cases.²⁰

Figure 5 states that, out of 58 females, 27 (46.55%) died due to asphyxia. Out of 58 females, 1 (1.72%) died due to trauma. Out of 58 females, 21 (36.21%) died due to burns. Out of 58 females, 9 (15.52%) died due to poisoning. Maximum females died due to asphyxia (46.55 %) followed by Burns injury and minimum females died due to trauma (1.72 %), i.e by jumping from height. Similar observations are noted Paranut Sritus et al (42.3%), Singh Kh (52.03%), Suresh Kumar (51.9%).^{15,21,11}

It has also been observed in the present study that dowry is a significant provoking factor than other provoking factors for suicides in case of burns injury with a significant p -value < 0.00001 , when compared. This justifies the term bride burning, which is a social evil growing in our society. Similar to the findings of Guntheti et al, where in dowry and Harassment from in-laws are important provocative factors.²² Similar findings are noted in Dere Rajesh et al and Meera T et al.^{23,24}

Table 5 states that, out of 58 suicidal deaths, 47 females are

menstruating (81.03%) and in 18.97 % cases, 11 cases are non-menstruating. Similar findings are stated by Baca – Garcia²⁵ et al according to which the first (or menstrual) and fourth (or premenstrual) week of the menstrual cycle may be associated with many suicide attempts in women.

CONCLUSION

Maximum female victims among suicidal deaths (37.93%) belongs to the age group of 21 to 30 years. Suicides among housewives is common. 44.8% females are illiterate belonging to lower socio-economic class which is suggestive of the fact that illiterate, poor females are economically dependent, making them susceptible to commit suicide which imposes the need of propagation of education and economical independency. Maximum females died within 1 year of her marriage (41.67 %). This may be due to inability of married females to adjust with the environment of in-laws in the early marriage years and hence, susceptible to marital disharmony and familial disharmony. Dowry (39.66%) and Domestic abuse (27.58%) are important provocative factors for suicide. In 34 female victims (58.62 %), no previous attempt of suicide is seen, in 65.52% female victims, suicide note is not found and in 47 cases, females are menstruating (81.03%) suggestive of the fact that these may not be planned suicides but happened in moments of emotional turbulence. Maximum females died due to asphyxia (46.55 %) followed by Burns injury.

Conflict of interest: No conflict of interest associated with this work.

Author's contribution: We declare that this work was done by the Author named in this article and all liabilities pertaining to claims relating to the content of this article will be born by the authors. The Author no 1 mentioned is involved in conducting the study and Author no 2 is involved in preparation of manuscript.

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CASE REPORT

Fatal formalin poisoning - a case report on forensic histopathology

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ABSTRACT

Formalin poisoning, mostly accidental, if not suicidal, is relatively common in those areas where the chemical is used or easily available like textile factory, rubber factory, printing etc. Strong irritation and offensive, pungent odour contributes to its rarity. Formalin poisoning affects all the systems as it is easily absorbed through respiratory and gastrointestinal tract and spreads in whole body through blood causing constriction in chest, palpitation, pain abdomen and gastrointestinal irritation, urinary abnormality, liver damage and clotting factors abnormality. This type of poisoning is rare and unusual. It's associated with high mortality rate, so proper elicitation of history, identification of the offending material and postmortem histopathology are essential. A 68 year old male was admitted with history of formalin poisoning after 7 hours and expired 40 mins post admission. Evident findings were prominent on autopsy followed by histopathology. The present investigation is an attempt to highlight the clinical picture along with autopsy histopathology in details of formalin poisoning. Such studies are essential in developing appropriate preventive strategies.

Keywords: *Submucosal petechial haemorrhages; acute tubular necrosis, steatosis; autopsy histopathology.*

INTRODUCTION

Formalin is a colourless liquid organic compound which is used both in healthcare industry and other industries. "All crystal clear liquid is not water" so goes the saying and it might lead to death. Accidental & suicidal formalin poisoning, usually accidental if not suicidal, is relatively common in those areas where this chemical is easily available, like in a rubber factory, printing & textile factories etc. Formalin is aqueous solution of formaldehyde, with about 37% to 40%

of formaldehyde in it.¹ It is colourless water like liquid which on oxidation produces formic acid which is also colourless with pungent, penetrating odour.² Relatively slow metabolism of formic acid in humans lead to its accumulation leading to metabolic acidosis. Formic acid is also an inhibitor of mitochondrial cytochrome oxidase to produce histotoxic hypoxia so that a significant part of the acid load results from hypoxic metabolism.³ It is irritating, corrosive, toxic & absorbed from all surfaces of body. Moreover it is a protoplasmic poison causing tissue fixation, coagulation necrosis, and protein precipitation.⁴ Few cases of fatal formalin have been reported in literature, but none depicts the combined and comprehensive array including clinical features, external and internal autopsy findings and histopathological profile with supporting figures together which has been attempted here.

CASE HISTORY

A 68 year old male was admitted with history of formalin poisoning 7 hrs 35 mins back. He was referred from local hospital after initial management. On admission patient had

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hypotension, tachycardia. He expired 40 mins after admission. Medicolegal autopsy was performed.

Post mortem findings

On external finding, conjunctiva was congested. There was greyish white discolouration in the inner aspect of both lips and tongue (**Figure 1**). External examination was unremarkable without any external injury. On opening the abdominal cavity, yellowish transparent peritoneal fluid was noted in small amount, intestinal walls appeared congested with evidence of patchy haemorrhages at places. Small intestine, on dissection, appeared to be thinned out, had lost its rugosity and was shrunken (**Figure 2**). On opening the oesophageal lumen, mucosal longitudinal streaky haemorrhages were seen. Mucous membrane of stomach was congested with multiple submucosal petechial haemorrhages at places. White streaks were seen on internal surface at places with blunt gastric rugae. Stomach contained small amount of partly digested food without any appreciable odour. Kidneys showed evidence of haemorrhages on its surface. On sectioning, poor cortico-medullary differentiation and haemorrhagic spots were seen. Liver showed patchy subcapsular haemorrhages at places.

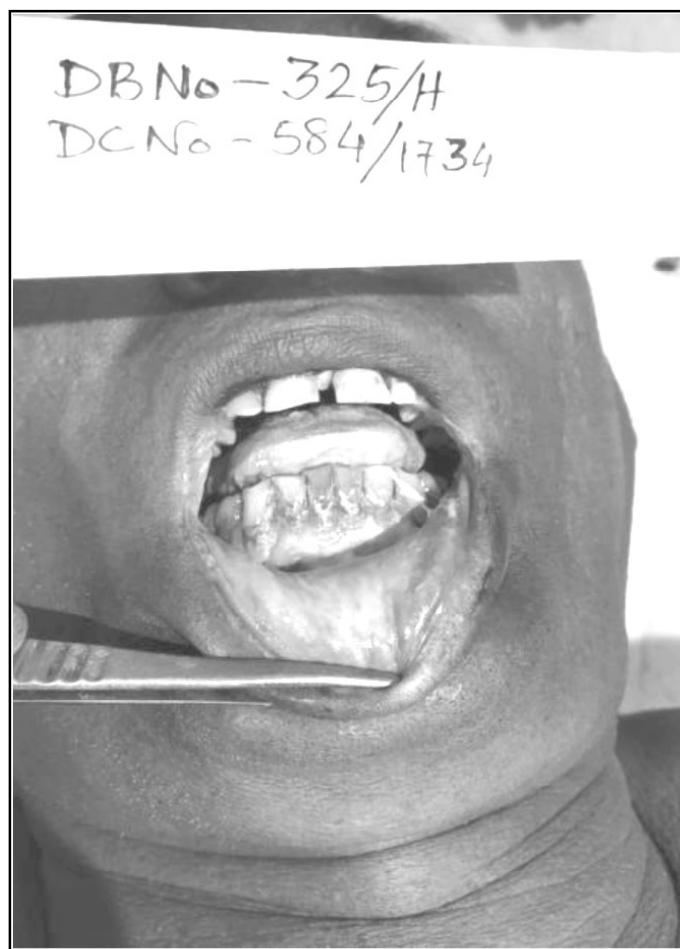


Figure 1 Greyish white discolouration in the inner aspect of both lips and tongue



Figure 2 Thinned out, shrunken small intestine with loss of rugosity

Histopathology findings

Stomach showed mucosal denudation & slough (altered exudates) at places along with polymorphonuclear infiltration (**Figure 3**). Gross congestion & haemorrhage at places seen, gastric glands are fixed and prominent with markedly oedematous lamina propria. Small intestine showed congestion and haemorrhage at places oedematous lamina propria. Kidney showed glomerular congestion, interstitial edema; interstitial haemorrhage with typical features of acute tubular necrosis (**Figure 4**). Features of steatosis with evidence of droplets, both microvesicular & macrovesicular was seen in liver (**Figure 5**). Increased infiltration of subcapsular lymphocytes was detected in liver.

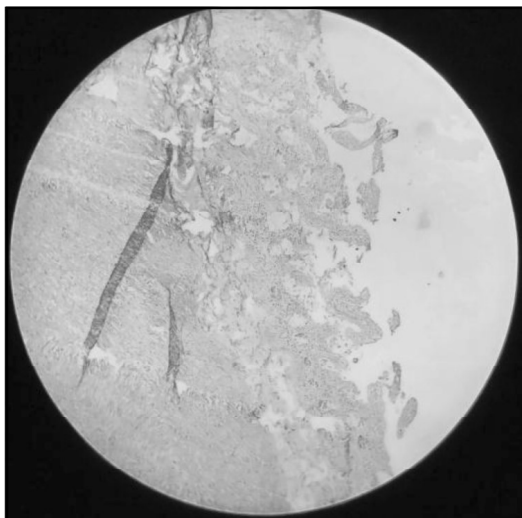


Figure 3 Mucosal denudation and slough with PMN infiltration, congestion and haemorrhage in stomach

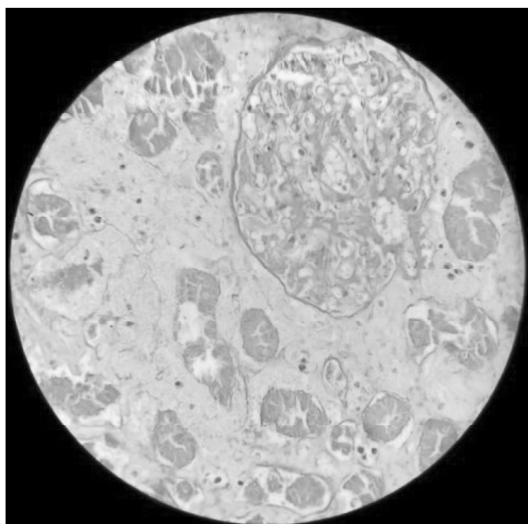


Figure 4 Typical features of acute tubular necrosis in kidney

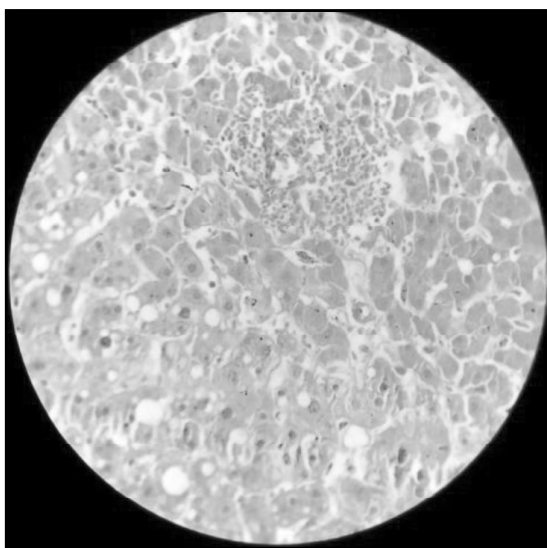


Figure 5 Steatosis with microvesicular and macrovesicular droplets in liver

DISCUSSION

Few cases of fatal formalin have been reported in literature, but none depicts the combined and comprehensive array including clinical, autopsy and histopathological profile together which has been attempted here. Ingestion of as little as 30 ml (2 tablespoon quantity) of 37% formaldehyde solution (formalin) has been reported to cause death in an adult, preceded by gastrointestinal absorption leading to severe corrosive damage to stomach and small intestine, circulatory collapse and kidney damage.⁴ Another case report depicts that the ingestion of formalin can lead to chemical peritonitis even without perforation.⁵ Case report from Karnataka found that renal failure is a frequent complication in this poisoning due to metabolic acidosis. Kidneys may also reveal microscopic evidence of acute tubular necrosis, which is consistent with authors' findings. Formaldehyde is a corrosive material that can make the skin & mucous membrane appear whitened.⁶ This was also seen in this case. A case report in Netherlands stated that systemic effects that can occur are shock, unconsciousness, convulsions and acute respiratory failure. Formalin poisoning frequently causes multiorgan failure.⁷ Another case report from India revealed stomach appearing like tea-pot with formalin smell and brownish black appearance of mucosa. Clinical effects of acute poisoning include hypotension and cardiovascular collapse; upper respiratory tract irritation, coughing, brownish black appearance bronchitis, pulmonary oedema, or pneumonia, ARDS (adult respiratory distress syndrome); lethargy and coma; nausea, vomiting, and severe abdominal pain; corrosive gastritis, oedema, ulceration and even perforation of the oesophagus.⁸ The stomach suffers the most severe damage in such cases because formalin is in contact with the gastric mucosa longer than other parts of the gastrointestinal tract. The phenomenon of perimortal fixation is a useful indication for the forensic pathologist and should direct the suspicion to oral poisoning.⁹ The introduction of formalin into the stomach is followed by the production of a gastritis which varies greatly in character. The duodenum and upper jejunum may also be involved in the inflammatory process. Formalin in whatever way introduced into the body is absorbed, and is then capable of producing lesions in the parenchymatous organs.¹⁰ Extent of formalin induced corrosive injury varies greatly upon duration of contact with mucosal surface. Oesophageal burn is rare due to prompt passage along through oesophagus, though in present cases streaky haemorrhages seen longitudinally along oesophagus.³ As whole esophagus, stomach, small intestine, kidney and liver are the target organs.² Cause of death may be varied as reported in various clinical reports which includes acute tubular necrosis,³ metabolic acidosis,⁴ histotoxic hypoxia⁶ acute respiratory failure⁷ circulatory collapse.⁸ Steatosis is not a feature of acute formalin poisoning, rather of chronic formalin exposure, though this case showed the said feature. Upon questioning the co-workers and fellow colleagues of the subject, they admitted that formalin was usually kept in common bottles (same as that of drinking water) and very often kept open. So

the vapours of formalin used to mix in the air to be inhaled by the workers leading to a chronic exposure. This was the circumstance of the poisoning that the subject mistakenly took formalin instead of drinking water. Toxicological analysis from forensic science laboratory also confirmed the presence of aldehyde in the samples of blood and viscera.

CONCLUSION

Treatment of these patients must be started promptly. Hypotension should be treated with fluids & vasopressors, metabolic acidosis with sodium bicarbonate judiciously. Forensic experts should be alert in such cases & proper autopsy protocol should be followed. Meticulous dissection & proper preservation of viscera for chemical analysis & histopathology is essential in such cases. Ingestion of formalin in significant amount usually has fatal consequences.

Conflict of interest: None declared.

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CASE REPORT

Craniocerebral gunshot injury with no neurological deficit: the trending neurosurgical challenge

Sharma Mitrajit¹, Barooah RK², Malakar Jaydeep³, Sudhy IK⁴

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ABSTRACT

Penetrating brain injury is a traumatic brain injury caused by high-velocity projectiles or low-velocity sharp objects. A wound in which the projectile breaches the cranium but does not exit is referred to as a penetrating wound. A large number of these patients who survive their initial wound will nevertheless expire shortly after admission to the hospital.¹ Here we discuss a case of penetrating bullet injury in a civilian, who presented with no neurological deficit and the management of the case along with a short discussion on the various presentation of the case and their respective neurosurgical management.

Keywords: Penetrating brain injury; civilian bullet injury; neurosurgery; neurology.

INTRODUCTION

Penetrating brain injury (PBI) is a type of traumatic brain injury (TBI) defined as brain trauma in which a low-velocity sharp object, such as a knife, or a high-velocity projectile, such as a bullet, penetrates the skull but does not exit it.² Craniocerebral gunshot injuries (CGI) are currently increasingly encountered in civilian setting. Although less prevalent than closed head trauma, penetrating brain injury carries a grim prognosis.³ CGI are the most lethal of all firearm injuries, with reported survival rates of only 7% to 15%.⁴ This study reports an interesting case of CGI with no residual neurological defect.

CASE STUDY

A 14 year old male presented with a history of homicidal penetrating bullet injury to brain with facial soft tissue injury. The GCS (Glasgow Coma Scale) on presentation was E₄V₅M₆ with an entry wound seen at 4 cm above the right eyebrow with no exit wound. CT (computed tomography) showed a foreign body in the right parietal region with surrounding cerebral edema and hematoma formations in the track of the bullet (**Figure 1** and **2**). Triple intravenous antibiotics, anti epileptics and osmotic diuresis were started. He had no neurological or motor deficit.

Right parietal curvilinear incision deepened and temporalis muscle retracted. Craniotomy done a pellet of 4 mm diameter is retrieved using bayonet forceps and continuous saline irrigation (**Figure 3**). Homeostasis achieved, duramater was not closed and bone flap repositioned. Post operative period was uneventful and case is in follow-up.

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Figure 1 CT scan showing the bullet position and bullet track

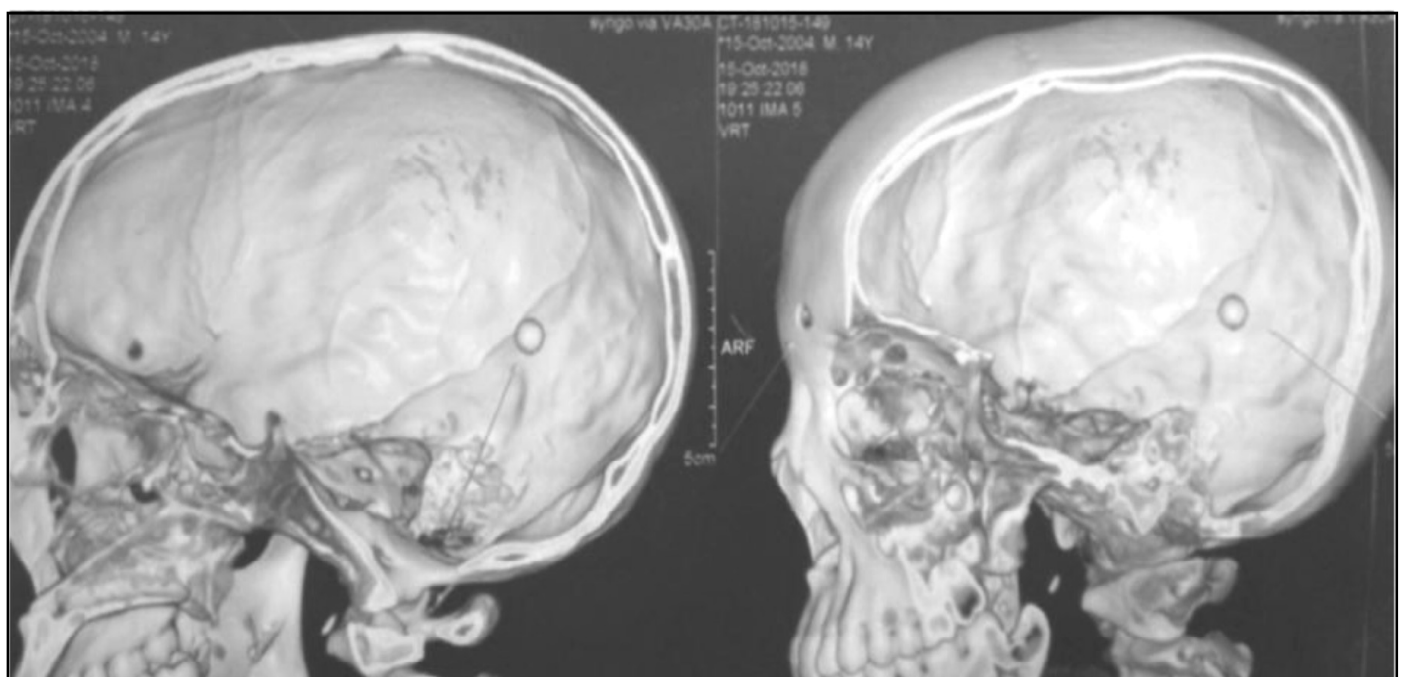


Figure 2 Scan showing the entry wound the bullet lodged in parietal lobe

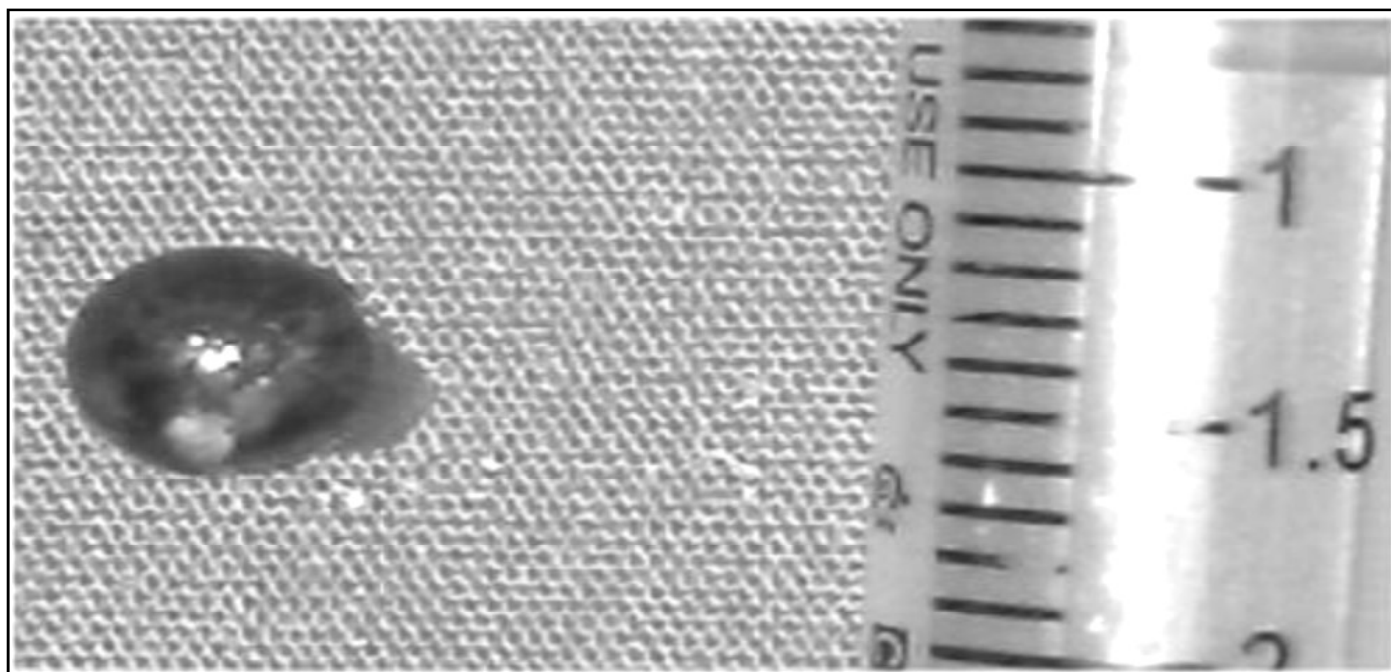


Figure 3 The pellet in comparison to scale

DISCUSSION

The introduction of Guidelines for the Management of Penetrating Brain Injury has revolutionized the management of PBI during the last decade. There has been a paradigm shift toward a less aggressive debridement of deep seated fragments and a more aggressive antibiotic prophylaxis to improve outcomes.⁵ We started with ceftriaxone + tazobactam, amikacin and metronidazole. CT (brain) scanning is the neuroradiologic modality of choice. Guidelines for the Management of Penetrating Brain Injury recommends the treatment of small entrance bullet wounds to the head with no significant intracranial pathology, with local wound care and closure. More extensive wounds with nonviable scalp, bone, or dura should be debrided more extensively before primary closure or grafting to secure a watertight wound is to be done if possible within 12 hours of the injury. When the trajectory of the missile violates an open air sinus, a water tight closure of the dura should be done as the literature suggests that it may decrease the risk of abscess formation and CSF fistulas.⁶ Advanced age, suicide attempts, associated coagulopathy, Glasgow coma scale score of 3 with bilaterally fixed and dilated pupils, and high initial intracranial pressure have been correlated with worse outcomes in PBI patients.

CONCLUSION

PBI, though less prevalent than closed head trauma, carries a worse prognosis. The publication of Guidelines for the Management of Penetrating Brain Injury in 2001, attempted to standardize the management of PBI. A precise medical and surgical management of these inimitable injuries present a significant challenge. A better and standardized study has to be undertaken to bring in lime light the best modality of treatment of such cases in our infrastructure.

Consent: Written informed consent was obtained from the

patient for publication of this case report and accompanying images.

Conflict of interest: None declared.

Ethical clearance: Taken.

Source of funding: None.

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CASE REPORT

Agenesis of the greater omentum with primary abdominal cocoon: experience of two cases

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ABSTRACT

Agenesis of the greater omentum along with primary abdominal cocoon is a rare condition. It is characterized by total or partial encasement of the small bowel inside a membranous bag. We report two cases of primary cocoon causing intestinal obstruction. The first case was encountered in the year 1998 and it was presented in a local conference as well as the Journal of the Association of the Surgeons of Assam. Long 21 years passed before we faced another case of agenesis of the greater omentum with primary abdominal cocoon causing acute dynamic small bowel obstruction. Both the cases were explored for unresolved obstruction and on table findings suggested primary abdominal cocoon. The findings were compared during the second case and the peculiarities were better noted, especially the agenesis of the greater omentum, presence of free peritoneal bodies. Photographs were taken.

Keywords: Intestinal obstruction; hypoplasia; agenesis of greater omentum.

INTRODUCTION

Agenesis of the greater omentum along with primary abdominal cocoon is a rare condition that refers to absence of the greater omentum from the transverse colon and along with total or partial containment of the small bowel inside a fibro-collagenous membrane bag leading to acute or chronic bowel obstruction.^{1,2} The cocoon has been described by various terms like 'peritonitis chronica fibrosa incapsulata' and sclerosing encapsulating peritonitis. We have encountered two patients who presented with features of acute intestinal obstruction due to abdominal cocoon and were treated successfully by surgery. Both the cases had agenesis of the

greater omentum. Abdominal cocoon syndrome, which was first defined in 1978,¹ is relatively rare, with descriptions in the literature limited to case reports. In this syndrome, a portion or all of the small intestine is inside a bag like structure with a fibrocollagenous membrane not containing the mesothelium. As it is a rare entity, and its clinical findings are nonspecific, it is diagnosed during surgery.² However, it can be diagnosed these days with contrast-enhanced abdominal computerized tomography during the preoperative period. Surgical removal of the bag like structure and adhesiolysis are the treatment in these cases. This article presents a series of two patients with agenesis of the greater omentum with abdominal cocoon, who were successfully and surgically treated.

MATERIALS AND METHODS

Two cases were encountered over a period of 21 years. First one a teenaged female, admitted with signs of acute dynamic intestinal obstruction. Plain X-Ray showed multiple gas fluid level in the pattern of small bowel obstruction. It failed to resolve on conservative treatment. Emergency exploration revealed a thick glistening membrane resembling a bag of peritoneum inside the peritoneal cavity. The bag had the whole of the small intestine inside. The terminal

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ileum was obstructed by the edge of the bag like a sharp band. The large gut was empty and no obstruction was found. The greater omentum was severely hypoplastic to the amount of almost agenesis. The sac was excised totally. The obstruction relieved. No resection was needed. Recovery in the postoperative period was smooth and uneventful. No photographs could be kept in the midnight surgery, but operation records were kept. It was published in the local non indexed, non peer reviewed journal in 1998 (JASA).

The Second patient, a 40 years old healthy young adult male, presented with acute Intestinal obstruction and was opened up emergently. The same glistening membranous bag was detected (**Figure 1**). The extent of the membranous bag was similar to the first case. The severely Hypoplastic or agenesis of the greater omentum was documented with photographs this time (**Figure 2**). Two peritoneal free bodies (Peritoneal Mouse) incidentally were found (**Figure 3**). These were photographed and sent for histopathological examination. The sac excised totally. The patient recovered to be discharged normally. No resection of bowel was undertaken. Ultrasonography and CT scan of the whole abdomen failed to detect the cocoon before surgery.



Figure 1 The Membranous bag



Figure 2 No Greater Omentum



Figure 3 The Free peritoneal bodies with the dissected out cocoon (sac)

Biopsy report from the membranous sac showed fibrous structure in a collagenous background. No evidence of any epithelium or mesothelium. The second case showed, both from the peritoneal mouse and the membrane, Fibrocollagenous tissue with occasional acute inflammatory cells. This too does not have any mesothelium. The pathologist suggested it to be samples of sclerosing encapsulating peritonitis.

RESULTS

Main clinical manifestations were complete intestinal obstruction in both the patients. The cases were diagnosed during exploratory emergency laparotomy. In both the cases, we found that most of the entire small bowel was encapsulated in a dense, glistening, smooth, white, fibrous, cocoon-like membrane, which looked like a bag of Peritoneum inside the peritoneal cavity. The greater omentum was absent in both cases. Excision of the membrane and release of adhesions were carefully performed to free the small intestine. Post-operative recovery in both the cases was smooth.

DISCUSSION

The agenesis of the greater omentum beyond the free border of the transverse colon could not be explained by the available embryological concepts. Abdominal cocoon however is classified as primary and secondary based on whether it is idiopathic or has a definite cause. The origin of the primary form is uncertain with various hypotheses, although it is probably caused by a subclinical peritonitis leading to the formation of a cocoon.^{1,3,4} Foo et al. detected the condition in 10 young girls with symptoms of intestinal obstruction two years post menarche.^{3,5} It was postulated that a chemical peritonitis was caused by retrograde menstruation leading to the formation of a cocoon.⁴ Secondary causes include the placement of Le Vein shunts

for refractory Ascitis, continuous ambulatory peritoneal dialysis, systemic lupus erythematosus, and the use of povidone iodine for abdominal wash-out, as well as the adrenergic blocker practolol. Practolol has been withdrawn from use because it was noted to cause the formation of a peritoneal membrane.

Clinically, patients with abdominal cocoon present with features of recurrent acute small bowel obstruction secondary to kinking and / or compression of the intestines within the constricting cocoon.⁶ An abdominal mass may also be present due to an encapsulated cluster of dilated small bowel loops.

Abdominal X-ray findings are non-specific. CECT is considered an useful investigation for preoperative diagnosis of abdominal cocoon. The imaging features are, however, not confirmatory. CT findings of a membrane enveloping loops of small bowel were seen in some paraduodenal hernias, abdominal cocoon, and in peritoneal encapsulation.⁴ However, the clinical and pathological features of these entities are different.

The final diagnosis of abdominal cocoon is usually based on intra-operative and histopathology findings, with a significant number presenting for emergency treatment without any imaging being performed. In all the reported patients, portions of the small bowel were encased within a fibrous cocoon.^{7,8}

Differential diagnosis also includes a condition called the peritoneal encapsulation, which is a developmental anomaly where the whole of the small bowel is encased in a thin accessory membrane. In peritoneal encapsulations, the patients are mostly asymptomatic and the findings are incidental and the patients present late in life. Treatment, as in the present case, consists of excision of the accessory peritoneal sac with lysis of the inter-loop adhesions. Bowel resection is unnecessary unless a nonviable segment is found.

In our two cases the hypoplasia or agenesis of the greater omentum was striking features along with the free peritoneal bodies. Other authors have also mentioned about this additional finding.⁷ The implications of these peculiar findings remain an enigma.

CONCLUSION

The clinical manifestation of Agenesis of the greater omentum along with abdominal cocoon is an enigma. We don't know the reasons of this association and could not explain the association. Abdominal cocoon otherwise is a specific and always present with intestinal obstruction of various stages. Preoperative diagnosis is difficult because

of its rarity. The Agenesis of the greater omentum and the presence of the free peritoneal bodies present in our patients remain a mystery. The treatment of Abdominal Cocoon is surgery, and the recovery of our two patients was also satisfactory. As abdominal cocoon is a rare condition, diagnosis requires a high index of suspicion. Peritoneal sac excision, adhesiolysis and removal of the free bodies were the treatment and the outcome was satisfactory.

Conflict of interest: None declared.

Ethical clearance: Taken.

Source of funding: None.

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REVIEW PAPER

Virtopsy: a recent advancement in traditional necropsy

Pathak MK¹, Jha SS²

Received on October 14, 2019; editorial approval on November 25, 2019

ABSTRACT

Virtopsy is 'Virtual Autopsy'. Virtopsy is a virtual alternative to a traditional autopsy, conducted with scanning and imaging technology. Radiographic methods were used to forensically analyse the victim's remains which aid the legal judgment. This instance is commonly heralded as the birth of virtopsy. Virtopsy has four cornerstones. It uses an all-in-one machine called 'Virtobot' which integrates the four imaging modalities mentioned above to practice virtopsy. The dissection of body is minimal, thus providing a more humanitarian approach. Infections and health hazards for forensic experts can be reduced.

Keywords: *Virtopsy; MSCT; virtobot; virtomobile; artefacts.*

INTRODUCTION

Virtopsy is 'Virtual Autopsy'. Its etymology is derived from ancient Latin and Greek languages. The word 'virtual' is derived from the Latin word virtues, meaning 'useful, efficient, and good'. 'Autopsy' is a marriage of the classical Greek terms 'autos' ('self') and 'opsomei' ('I will see'), meaning 'to see with one's own eyes'. Thus, the terms 'virtual' and 'autopsy' merge to form 'virtopsy'.¹

An autopsy is a procedure which surveys the mortal remains of a person to identify the cause of death.² Forensic medicine deals with the examination and identification of relevant medical data in both the living and deceased and presentation of the same with exhaustive scientific matter for judicial proceedings.³ Autopsy is also referred to as necropsy or postmortem examination and is revered as the cardinal expertise in forensic science. It is thus fondly called 'the expertise of expertise'.⁴

The conventional procedure in postmortem examination is dissection, interpretation, and cataloguing.⁵ The data obtained from this examination is then compiled, and the forensic experts arrive at a conclusion. The dead body is then handed over for the last rites to be performed. However, if the forensic expert wants to reconsider his/her decision over the previously gathered data, it may be difficult and not feasible.³ The possible mutilation involved in the conventional autopsy often leaves the grieving family disturbed. Thus, the family of the deceased declares a negative consent for autopsy procedure on a sentimental basis.⁶ Certain religious groups such as the Jews, Muslims, Jehovah's witnesses do not completely accept conventional autopsy procedures.⁷ These pitfalls of a conventional autopsy led to the genesis of virtopsy.

Virtopsy is a virtual alternative to a traditional autopsy, conducted with scanning and imaging technology.

History

In the late 1990s, a high-profile homicide case in Switzerland demanded an accurate forensic opinion. The impressions of the skull of the victim had to be matched with a most likely murder tool. The extensive work followed in this arena focusing on an objective method of forensic analysis which

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would minimally disturb the skull of the victim. Radiographic methods were used to forensically analyse the victim's remains which aided the legal judgment. This instance is commonly heralded as the birth of virtopsy.³

Examination of dead by virtopsy: In 2003, a 3000 year old mummy was subjected to virtopsy methods to find out manner of death, cause of death and identification of the deceased. Virtopsy methods were ground breaking in that they have established a new high-tech toolbox into morphological investigation aspects of modern forensic pathology.⁶ Since virtopsy is non-invasive, it is less traumatic for surviving family members and may not violate religious taboos against violating bodily integrity.⁷

Examination of the living: Non-invasive imaging is also conducted in living or surviving subjects, but as that has been the main clinical application of CT and MR imaging to begin with, their use in medicolegal investigation of the living is not as ground breaking as using them for investigation of death. Nevertheless, a number of applications that may be regarded as specific for medicolegal imaging applications in the living have found attraction for Virtopsy-derived methods:

Matching weapon or injury-causing agent and injury. The application of 3D surface documentation of injuries for the benefit of medicolegal reconstruction must be accredited to Brueschweiler et al. (2003).⁸

Strangulation and estimation of risk of death: The first paper documenting systematic application of MRI to survivors of strangulation for the benefit of forensic medicine was published by Yen et al. in 2005.⁹

Body packing: According to a paper of the Virtopsy group, CT scanning may be more suitable to body packer identification than conventional or plain abdominal X-rays.¹⁰

TOOLS OF VIRTOPSY

Virtopsy has four cornerstones, namely,

- Three-dimensional surface scanning 3D/computer-aided design photogrammetry,
- Multi-slice computed tomography (MSCT),
- Magnetic resonance imaging (MRI)
- MRI spectroscopy.¹¹

Three-dimensional surface scanning three-dimensional/computer-aided design photogrammetry

It is the science of making measurements using photographs. A number of different photographs are taken from different angles and are analysed by TRITOP/ATOS II system (GOM, Braunschweig, Germany) software.¹² This software uses high-speed imaging and remote sensing to construct a 3D comprehensive image of the surface features of the deceased.

Multislice Computed Tomography (MSCT)

It features the hard tissue architecture in multiple sections. It aids in the identification of any changes in the same.

Magnetic resonance imaging

It features the condition of the soft tissue. It aids in the identification of any changes in the same. MSCT and MRI together help in the differentiation of the adjacent structures.

Magnetic resonance imaging spectroscopy

It provides the biochemical picture of the deceased. It uses metabolites in the brain emerging from post-mortem decomposition to give an accurate time of death.

Micro-computed tomography

Special cases require modifications of the above-mentioned techniques. The Institute of Medical Physics in Erlangen, Germany, developed a scanner to image a 3D volume with an isotropic resolution ranging from 10 to 100 μm .¹³ This scanner is sensitive to examine samples of diameters ranging from 4 to 40 mm.

Magnetic Resonance Microscopy

In vitro studies on eyeballs were anatomically imaged. After this, eyeballs were paraffin embedded, and sections of 6 μm were cut and stained with hematoxylin and eosin.¹⁴

Technology

The technology currently used for conducting a 'virtual autopsy' comprises:

Robot-guided surface scanning for three-dimensional documentation of the surface of the body, to scale and in colour.¹⁵ This supplements the external post-mortem examination of the body, that is done in a conventional autopsy.

Multislice spiral CT and MRI for visualising the body in 3D. This supplements the internal post-mortem examination of the body in an autopsy.¹⁶

Post mortem angiography: which visualises the cardiovascular system of the deceased with the aid of a peristaltic pump and contrast medium.¹⁷

Image- and robot-guided, contamination-free sampling for a wide range of supplementary forensic analyses, such as histology, bacteriology, virology, toxicology and diatomology.¹⁵ This procedure replaces the usual collection and storage of sample material from the body.

Practice of virtopsy

Virtobots

In this era of robotics, virtopsy is not to be left behind. It uses an all-in-one machine called 'Virtobot' which integrates the four imaging modalities mentioned above to practice virtopsy. This machine will allow combined surface and body volume data acquisition within a single 3D space, making present-day data fusion techniques dispensable.

Virtomobile

Virtobot is a gigantic machine making its utility in the sites of mass disaster futile. This leads to the requirement of a more compact device for the practice of virtopsy. Thus, virtomobile was conceived. It is a version of Virtobot mounted on a trailer which can be easily transported to the site of disaster.²

Procedure of virtopsy

In virtopsy, there is fusion of the technologies of medical 3D imaging techniques as well as a 3D surface scan used in the automobile designing used to map the external surface of the body. It records and documents the 3D image of the body surface area in detail.¹⁸ Figure 1-3²⁰ are depicting the tools and procedure of virtopsy.

Benefits of virtopsy¹⁹

- It can be done in highly infected dead bodies or those with radioactive exposure.
- The dissection of body is minimal, thus providing a more humanitarian approach.
- It is preferred by family members due to its non-invasive nature.
- It saves time and data can be stored indefinitely.
- Opinions are more observer-independent and less subjective.
- It can be used to complement standard autopsies and increase the quality of autopsies.
- It permits additional analysis on the same body by other forensic pathologists, i.e., should allegations creep up in the future, second or third opinions can be sought even years later.
- Visualisation tools increase the quality and efficiency of forensic methods.
- Infections and health hazards for forensic experts can be reduced.
- In cases involving the compression of the neck, haemorrhages that are not visible to naked eye can be detected. Similarly, internal bleeding, bullet paths, hidden fractures bone and missile fragmentation, brain contusions and gas embolisms that are hard to find in a traditional autopsy can be detected. **Figure 4**²¹ is depicting the use of post-mortem CT in a case of strangulation.
- Unlike a traditional autopsy, a virtopsy does not destroy the human tissues.
- This can be an important tool in medical teaching.

Demerits of virtopsy

- Colour changes of contusions in deep muscles are not visible.
- Smaller haemorrhages may be missed.
- Hairline fractures may not be seen.

- Expansive investment.
- Artefacts are difficult to identify.
- Odour and colour changes on the skin at the time of arrival of corpse may not be recorded.
- Very fine surface features cannot be studied.

CONCLUSION

Virtual autopsy should replace the conventional method of post-mortem examination. The mental anguish suffered by relatives of the deceased due to mutilation of the corpse can be prevented by virtual autopsy. It should be provided to at least district headquarters of every state or should be at least done in all 29 states of the country.

The conventional post-mortem method is not the proper dignified way and is violation of human rights so human right activists should raise their voice on this pertinent issue to the government. Virtual autopsy provides a ready to compare and reference data whenever the need arises as post-mortem report is in a digital form, there are less chances of manipulation of data.

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Photographs^{20, 21}



Figure 1 Virtobot room. A: X-Ray shielded working area; b: CT-gantry; c: CT table; d: external rail of the Virtobot; e: Virtobot mounted on external axis with lifting mechanism; f: tool stand with surface scanner, digital photo camera and biopsy module; g: monitor which is connected to the computer running the Virtobot software; h: safety light fence for device protection.

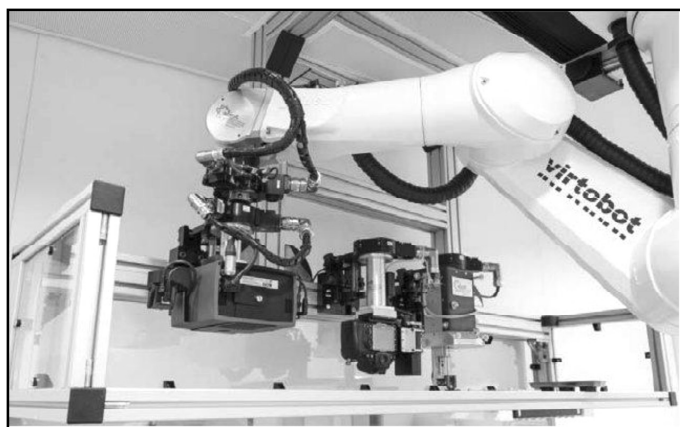


Figure 2 Tool stand during automatic tool change. Left to right: Surface scanner, digital photo camera for photogrammetry and biopsy module.

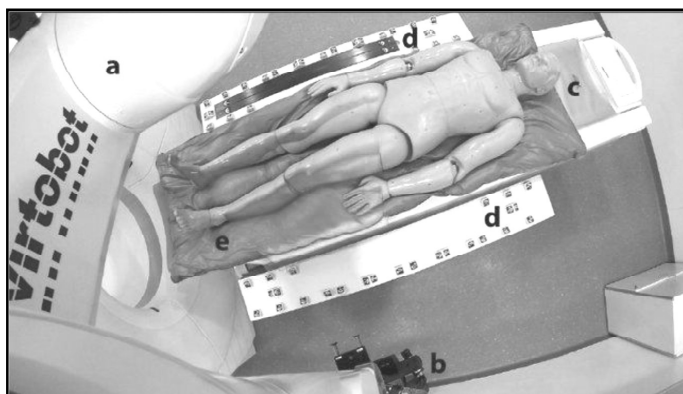


Figure 3 Setting for surface documentation. a: Virtobot; b: mounted optical 3D surface scanner; c: CT-table; d: attached side boards with integrated markers and scale bars; e: deceased placed on a vacuum mattress.

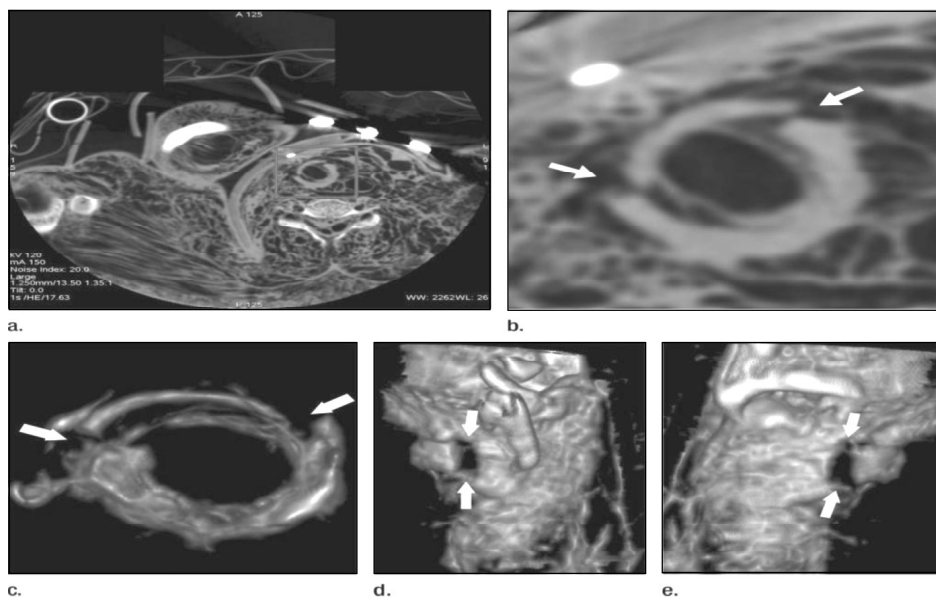


Figure 4 a: Axial cervical post-mortem CT scan; b: zoomed section of the cricoid cartilage (box in a) of a 27 year-old woman who died of strangulation. Three-dimensional volume rendered reconstructions from cranial; c: left lateral oblique; d: right lateral and e: oblique views.

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REVIEW PAPER

Wuhan Coronavirus: a fast-emerging global threat

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ABSTRACT

A novel coronavirus known as 2019-nCoV was identified in Wuhan when people developed pneumonia-like symptoms in the Wuhan town of China in December 2019. In a brief period, it gained international prominence as it very rapidly spread to many other countries due to the movement of people from China to other countries. Coronavirus gained epidemiologic importance due to occurrence of 2 pandemics earlier in the 21st century. The latest 2019- nCoV outbreak is believed to be a zoonotic infection, transmitted to the Human from unknown animal. MoHFW, Govt. of Indian collaboration with WHO is closely monitoring the situation in India.

Keywords: *Coronavirus; Wuhan; pandemic; respiratory infection; droplet transmission.*

INTRODUCTION

Coronavirus is a group of zoonotic viruses, derived its name from a Latin word meaning “crown” due to its typical shape as seen under an electron microscope.¹ Till 2002, four strains of coronaviruses caused mild type human disease, i.e. 229E, NL63, OC43 and HKU1. However, post-2002, scenario dramatically changed with the emergence of two highly virulent strains, namely SARS (Severe acute respiratory syndrome) in 2002 and the Middle East respiratory syndrome (MERS) in 2009.¹ But come 2019 December, world came face to face with another virulent corona strain named 2019 novel Coronavirus or 2019nCoV (tentative preliminary name, most likely to be replaced).²

Coronaviruses are considered to be one of the larger RNA viruses and in fact, the largest known RNA virus (120-160 nm size). This is a positive sense RNA containing virus

with the presence of typical features like envelopes, spikes/peplomer etc. Enveloped viruses (e.g. HIV) are amenable to killing by heat, organic solvents, common antiseptics while non-enveloped ones (e.g. Poliovirus) are relatively sturdy. Agents like Ethyl alcohol (70%) or Isopropyl alcohol, Sodium hypochlorite (0.1%), Povidone-iodine (10%), Glutaraldehyde (2%), various Quats can very effectively destroy Coronaviruses.³

Timeline for current outbreak from Wuhan, Hubei Province, China⁴

- Dec 31 2019: First report emanating that a cluster of pneumonia in Wuhan, China; Wuhan Municipal Health commission examines the outbreak and issue a notice
- Jan 1 2020: Wuhan South China Seafood market is closed and decontaminated thoroughly
- Jan 5 2020: Wuhan Municipal Health commission announces that Influenza, SARS and MERS are excluded as possible pneumonia cases.
- Jan 8 2020: China Centre for Disease Control and Prevention (CCDC) declares that a novel Coronavirus has been isolated from Wuhan pneumonia patients and

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15 +ve cases confirmed.

- Jan 10 2020: First genome sequence released by Prof. Yong Zhen Zhang of Fudan University; First casualty.
- Jan 11 2020: five additional gene sequences released to GSAID by Wuhan Institute of Virology, CCDC, Chinese academy of medical sciences, and Peking Medical College.
- Jan 13 2020: Thailand Ministry of Public Health announces travel from China becomes positive for 2019nCoV.
- Jan 15 2020: Second fatality, associate with reported, Culture.
- Jan 16 2020: Japan declares a positive case - a travel history to Wuhan elicited. Four new cases from Wuhan.
- Jan 17 2020: 2nd Traveler from Thailand. 17 new cases from Wuhan.
- 18-19 January 2020: Wuhan identifies 136 new cases from Wuhan and 2 new cases from Beijing and 1 from Shenzhen. 3rd death identified.
- Jan 20 2020: 15 new healthcare people infected in Wuhan. WHO convenes an emergency committee of the International Health Regulation.
- Jan 23 2020: 625 total cases, and 18 deaths in China. Quarantine in Wuhan and adjoining area (+ve cases)

Pathogenesis and Transmission

Coronavirus family (with various members) are usually found in a wide variety of animals as a commensal or zoonotic disease-causing agent, e.g. camels, cattle, Monkeys, Himalayan palm civets, raccoon dogs, cats, dogs, bats, snakes and rodents etc. But for a reason not very clear yet, mutations occur and viral strain gets transmitted to the human being –i.e. jump the species barrier. After this, a cycle of Human to human transmission may ensue. SARS (2002), MERS (2009) and now Wuhan virus or 2019 nCoV are strikingly similar in this respect. All three of them are believed to originate from the bat - then into a mammal and finally to human.⁴

In the current case, preliminary investigations lead to a link to Seafood and Animal Market in Wuhan City. However, certain other lab-confirmed cases were not linked with this place in any way - direct or indirect. Conspiracy theories are doing round, especially in social media, that the virus is manmade. But this speculation is without any proof (epidemiological nor molecular) whatsoever and cannot be endorsed in any way due to want of any evidence. Most of the facts on 2019 nCoV are based on other Coronaviruses only.⁵ Human to human transmission of the current agent is, however, is a foregone conclusion. This transmission occurs by respiratory routes (droplets, and probably aerosol) and also via a direct transmission (or fomites), i.e. touching contaminated surfaces, nose, mouth, eye etc.⁵⁻⁷ Sizes of

infectious respiratory droplets are usually more than 5-micron size which generally cannot travel beyond 3 feet (1 meter). Hence a distance of 1 meter from an infected person is considered a safe distance.²

One very alarming aspect of 2009 nCoV is that the virus can be transmitted by asymptomatic individuals. This characteristic was not present in the previous outbreak avatars of Coronavirus (SARS & MERS).⁸

Clinical presentation

Based on whatever data available till date, the incubation period of 2019 nCoV is believed to be from 2 days to 2 weeks. This includes fever, cough and shortness of breath. Chest X-ray may present bilateral infiltrates.⁸ The disease may range from mild to severe with ARDS (acute respiratory distress syndrome) and death.⁷

Recent case studies reported the most common symptoms at the onset of disease were fever, cough, myalgia or fatigue and shortness of breath among 83-98%, 46-82%, 11-44% and 31% patients respectively. Some patients also reported sore throat in early stage of illness while expectoration, headache, hemoptysis, and diarrhoea were reported less commonly.^{9,10} Surveillance case definition mentioned about 3 types of clinical cases, i.e. Suspected case (lab confirmation not available/pending), Probable Case (Lab confirmation not explicit), Confirmed case (Lab confirmed case).⁹

Laboratory diagnosis

World Health Organization (WHO) has earmarked a network of labs in collaboration with the Centre for Disease Control and prevention in USA (CDC) and China. In India, Indian Council of Medical Research (ICMR) came out with the SOP for Specimen Collection, Packaging and Transport Guidelines for 2019 Novel Coronavirus (2019 nCoV) and NIV Pune is designated as the apical centre for diagnosis. As per ICMR guidelines, in India lower respiratory samples (Sputum, BAL) upper respiratory samples (Nasopharyngeal swab, Throat swab & nasal swab) EDTA blood and Serum (in clot activator) is needed to collect from all suspected cases with a direct or indirect link with Wuhan or affected area of China. However, with progress (or regress) of the outbreak with time, this advisory may change. Currently only prescribed test for laboratory diagnosis is real-time reverse-transcriptase polymerase chain reaction as per protocol devised at CDC. Cell culture virus isolation is being tried for research purpose only.^{9,11}

Management: Management of suspected and confirmed cases are primarily for symptomatic support and prevention of further spread. We do not have any effective drug nor any vaccine till now. As per ICMR interim guidelines, suspected cases with clinical features linked epidemiologically to Wuhan or other affected areas need to be isolated in quarantine facilities for at least 14 days or till results (RT-rt PCR) results came negative. Such lab negative cases are

to be quarantined at home and retested if needed under the supervision of State IDSP (integrated disease surveillance Project) officials. There is the provision of screening at major airports, especially for symptomatic subjects. But with the evolution of the outbreak, depending on the trend of infection spread, national guidelines will also evolve.⁹

Prevention and control of the outbreak

Scientific details and facts on 2019 nCoV outbreak are still very limited; most of the information are derived from other members of the coronavirus family. Case fatality rate (number dying per hundred affected people) in the current outbreak is believed to be between 2-3% which is way less considered to SARS (9.5%) and MERS (34.4%). Same for Ebola virus is 63%, and H1N1 is at 0.01-0.02%. Nosocomial transmission rate (infection occurring in hospital - to next patients, doctors, nurses or other health care workers) in SARS and MERS were high at 58% and 70% respectively. Same for the current agent is not known yet.¹²

In the absence of any effective drug or vaccine outbreak, management is based on the prevention of infection and control of disease transmission. Transmission based precautions (contact precautions, droplet precaution and airborne transmission precautions) along with patient isolation are the backbone of the global effort going on.¹²

Preparedness: Clear understanding on adopted standard operational procedures (SOPs), as advised by national agencies, and dissemination of information to HCWs (Health care workers) in respect to PPE (personal protective equipment) use- i.e. how to don, doff and store PPE etc. are must. Isolation wards are to be prepared as per national guidelines. It is to be designated as airborne Infection Isolation Room (AIIR) with negative pressure (minimum 0.006 water column) having a minimum of 12 air change/hour. Sufficient and appropriate supplies of N-95 respirators, gloves, full-sleeved, disposable gown, eye protection, biomedical waste bins, hand wash material, a natural detergent and chlorine-based solution for disinfection etc. need to be available. All HCWs should be well trained on the proper use of these.¹³

Standard precaution: Standard precautions is based on the presumption that each individual is likely to have the infection leading to widespread dissemination in the healthcare facility. Components for standard precaution include Hand hygiene, Respiratory hygiene and cough etiquette and injection safety.^{6,8}

Liaison with State and National authorities: In India, IDSP (Integrated Disease Surveillance Project, Govt. of India), ICMR and NIV Pune etc. are the relevant liaison agencies between various stakeholders in the current outbreak. Hence a consistent and continuous interaction with nodal officer State/District IDSP is beneficial for all concerned.^{9,13}

CONCLUSION

Whatever may be the source of the current agent (2019 nCoV), it is a fact that the outbreak is spreading and fast-evolving into a pandemic affecting multiple countries globally. Efficient Human to human transmission is a reality now with the possible (not conclusive yet though) asymptomatic transmission. There is no effective drug, neither any vaccine with least likely hood any of them being available in the near future. Concerted effort to control and contain the outbreak by the global community is already in place, and it is expected to bring good result within the next few weeks or months. This is more so given the fact that we exactly achieved this target successfully in past that too in another Corona Virus outbreak (SARS outbreak) without any vaccine nor any drug. Corona being a temperature-dependent virus, it is expected infection will dwindle with the onset of summer.

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MEDICO-LEGAL QUORIES

WHAT EVERY DOCTOR SHOULD KNOW

Medicine is a noble profession and doctors have the highest responsibilities over the life of a patient. However, this profession requires advanced education and training, which calls for continuous updating. At the same time, a doctor has ethical and legal obligations, and he needs to abide by the laws of the land while discharging his duties. In medical practice, most of the doctors would come across the 'medico-legal case' (MLC) to be appropriately addressed.

Question :

What is medical negligence?

Dr Kalim Ullah BDS, MDS

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Answer:

Medical negligence, Professional negligence or Malpraxis is the absence of reasonable care and skill in the treatment of a patient, resulting in injury or death.

In simple words, doing something that should not have been done (commission) or not doing something that should have been done (omission) under reasonable circumstances will constitute negligence. Civil negligence is filed in a civil court for damages and Criminal negligence where criminal charges are filed in a criminal court.

For proving negligence, it has to be proved that the doctor had a Duty of care, there was a Dereliction of duty, Damage has actually occurred and is Directly caused due to the dereliction.

Question :

What are the most important causes of medical litigation?

Lack of proper communication is considered as the commonest reason for medical litigation.

Some important causes are:

1. Lack of proper informed consent
2. Missed or delayed diagnosis
3. Failure to treat
4. Surgical or anaesthesia errors
5. Medication errors
6. Post-operative care
7. Childbirth injuries
8. Defective medical devices.



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